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Minister of Agriculture

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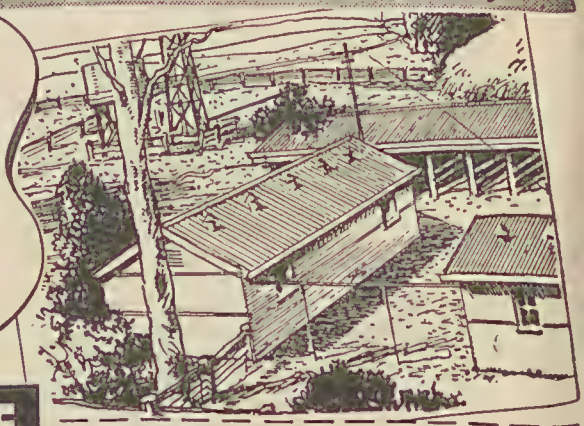

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# FAT LAMB RAISING IN THE MALLEE

FOREWORD by W. B. MILLER, M.Agr.Sc., SENIOR INSPECTOR OF AGRICULTURE.

In 1938 the Australian Animal Production Committee adopted a recommendation of its Fat Lamb Production Sub-Committee to the effect that further investigational work regarding the breeding and feeding methods used in fat lamb production should be carried out. Plans for comprehensive and co-ordinated field work in Victoria at the Mallee Research Station, Walpeup, and the Rutherglen Experiment Farm, however, had to be curtailed when the war intervened, but in view of the need for fundamental data on several aspects concerning breeds, the more important trials were retained in the reduced activities of these Stations and were carried out with technique as detailed as the circumstances permitted.

In Victoria, fat lambs for both the local and export markets are principally the progeny of cross-bred, half-bred or comeback type ewes sired by rams of British breeds. They are produced in practically every district, and in markedly different environments where, for example, the average annual rainfall ranges from 12 inches in the Mallee to over 30 inches in Gippsland.

At the Mallee Research Station, half-bred ewes of various crosses have been bred, and transferred to Rutherglen for comparison as mothers of fat lambs, the wether lambs being sold in the spring. Various aspects of these and related trials and some of the results are described herein and others will be dealt with in a series of articles to be published in this Journal from time to time.

## Results of Trials at the Mallee Research Station

By H. J. SIMS, M.Agr.Sc., Dip. Com.,* and C. G. WEBB, M.Agr.Sc.†

### *The Production of Half-bred Lambs*

ONE of the most outstanding features of Mallee farming during the past few years has been the increasingly important part played by sheep. While their introduction was primarily a means of providing an economic return from land out of cultivation, and for the control of weeds on fallows, they have been an important means of increasing meat production during the war years.

In 1939, an experiment was commenced at the Mallee Research Station, Walpeup, with the twofold objective of:—

(*a*) Producing from Merino ewes several types of breeding ewes to be forwarded to the Experiment Farm, Rutherglen, for testing as mothers of fat lambs in a "safe" district.

(*b*) Comparing various breeds of rams as sires for the production of fat wether lambs. Typical registered Border Leicester, Corriedale, and Dorset Horn rams from several stud flocks were chosen as sires to mate with the Merino ewes.

### *Method of Experimentation*

Late in 1939, 201 young Riverina Merino station-bred ewes were purchased by auction and divided into three even flocks. One was mated with Border Leicester rams, another with Corriedale rams, and the third with Dorset Horn rams. Mating commenced on 24th November, 1939, and continued until 9th February, 1940, the period being longer than usual to ensure that a large percentage of ewes became pregnant. During mating, at the conclusion of which the ewes were run together, the flocks were kept under conditions as comparable as possible. Regular weighings were conducted from the commencement of mating until the commencement of lambing just prior to which each ewe was branded on the rump with its individual tag number. Each lamb was tagged as soon after birth as possible and the following details were recorded:—(*a*) No. of lamb or lambs, (*b*) No. of ewe mother, (*c*) Date of birth, (*d*) Sex of lamb.

The date of marking was added later.

Routine weighings were continued until 18th September, when the wether lambs were

* Manager, Mallee Research Station, Walpeup.

† Science Field Officer.

despatched to Western and Murray Co-operative Company Limited for slaughter on 19th September. The following details were recorded at slaughter:—

1. The live-weight of the lamb at the time of despatch from Walpeup.
2. The cold-dressed weight of the lamb.
3. The quality grade of each lamb.
4. The average skin value of each cross.

From these figures it was possible to compute a value for each individual lamb and obtain a direct comparison between the crosses on any scale of values per lb. Twins were excluded from the comparisons as their incidence is irregular. Ewe lambs were shorn and weaned soon after the despatch of the wether lambs.

At shearing time the individual fleece weights, including bellies, pieces, and backs of each sheep were recorded, and later an independent valuation and description of every class was given by Goldsbrough, Mort, and Company Limited.

In November, 1940, an additional 129 two-tooth Merino ewes of the same blood as the original flock were purchased, and all ewes were mated on 15th November to the same three breeds of rams as in 1939. A number of factors was taken into consideration when randomizing the ewes for mating, viz:—The groups in which they were mated in 1939, ewes which reared lambs, ewes whose lambs died at birth, ewes which did not produce lambs, and maiden ewes. This plan was followed in succeeding years and the dates of the principal operations during the experiment are set out in Table I.

In 1939 and 1940, 3 per cent. of rams was used, while in the last two years the number was increased to 4 per cent.

Table 2.—Seasonal Conditions During the Period Under Investigation.

*Monthly rainfall during the experiment.*

| — | 1939. | 1940. | 1941. | 1942. | 1943. |
|---|---|---|---|---|---|
| | pts. | pts. | pts. | pts. | pts. |
| January .. .. | 13 | 38 | 358 | 36 | 61 |
| February .. | 343 | 58 | 12 | 89 | 15 |
| March .. .. | 12 | 19 | 99 | 5 | 10 |
| April .. .. | 222 | 145 | 16 | 80 | 99 |
| May .. .. | 135 | 23 | 9 | 182 | 31 |
| June .. .. | 183 | 14 | 185 | 206 | 73 |
| July .. .. | 87 | 92 | 161 | 218 | 63 |
| August .. .. | 150 | 36 | 61 | 232 | 132 |
| September .. | 47 | 135 | 148 | 64 | 151 |
| October .. .. | 37 | 17 | 253 | 116 | 150 |
| November .. | 196 | 76 | 95 | 116 | 82 |
| December .. | 3 | 48 | 73 | 30 | 72 |
| Total .. | 1,428 | 701 | 1,470 | 1,374 | 939 |

## *Seasonal Conditions*

1939–40.—Mating took place at the conclusion of a very good season and the ewes were on good feed throughout the mating period. It was possible to lamb down on a stubble paddock which had not been grazed since harvest, and with comparatively few ewes on hand this feed lasted until it was seen that stubble-sown crops in the dry spring would not yield much hay and the lambs were finished on the green crops.

1940–41.—Although the ewes were mated at the end of a poor season, mating was carried out under fair conditions with dry feed which was supplemented by self-sown cereals which

Table 1.—Number of Ewes Mated, Dates of Mating, Shearing, and Slaughtering of Lambs.

| — | 1939–40. | 1940–41. | 1941–42. | 1942–43. |
|---|---|---|---|---|
| Number of ewes mated per flock .. .. .. | 64 | 106 | 102 | 98 |
| Date ewes mated .. .. .. .. | 24th Nov. | 15th Nov. | 14th Nov. | 13th Nov. |
| Shearing .. .. .. .. .. .. | 12th Sept. | 15th Sept. | 21st Aug. | 24th Aug. |
| Wether lambs slaughtered .. .. .. .. | 19th Sept. | 21st Oct. | (c) 6th Oct.<br>(d) 13th Oct. | (c) 6th Oct.<br>(d) 24th Oct. |

Note.—In 1942 and 1943 the lambs were sent to the works in two drafts.

TABLE 3.—MEAN MAXIMUM TEMPERATURES AND EVAPORATION AT WALPEUP DURING THE MATING PERIOD.

| — | 1939–40. | | 1940–41. | | 1941–42. | | 1942–43. | |
|---|---|---|---|---|---|---|---|---|
| | Mean Maximum Temperature. | Evaporation. | Mean Maximum Temperature. | Evaporation. | Mean Maximum Temperature. | Evaporation. | Mean Maximum Temperature. | Evaporation. |
| | F. | in. | F. | in. | F. | in. | F. | in. |
| November .. | 74·9 | 5·83 | 76·5 | 7·64 | 81·1 | 6·65 | 80·3 | 7·12 |
| December .. | 82·3 | 8·64 | 87·3 | 10·77 | 85·8 | 9·05 | 88·8 | 9·83 |
| January .. | 86·7 | 9·16 | 84·5 | 8·56 | 88·9 | 9·82 | 88·9 | 10·03 |
| February .. | 84·4 | 8·27 | 84·0 | 8·36 | 87·1 | 7·21 | 87·8 | 8·80 |
| March .. | 89·7 | 8·21 | 77·8 | 6·14 | 82·8 | 7·16 | 85·2 | 7·60 |

germinated after excellent early rains in 1941. The comparatively poor lambing percentage in this year was due to the preponderance of maiden Merino ewes rather than to poor feed during the mating period. Some trouble was experienced with pregnancy toxaemia just prior to lambing, but after this had been overcome by hand-feeding and transfer of the ewes to better pasture, the ewes and lambs were grazed on oats from 1st July until the lambs were sold.

1941–42.—A prolific growth of cover crops late in 1941 made it possible to mate the ewes on rank green feed and the good stubbles enabled the flocks to be kept well fed until the lambs were dropped. Conditions were again good for the growth of sown cereals but trouble was experienced with entero-toxaemia. The lambs suffered a slight check when it became necessary to put them on dry feed in order to control this disease.

1942–43.—Good stubbles again provided favourable conditions for mating and a good stubble paddock was kept for lambing. Soon after the commencement of lambing, however, serious trouble was experienced with stinkwort poisoning and it became necessary to hand-feed the ewes and lambs on silage, hay, and chaff until good rains late in September provided the green feed to finish off a proportion of the lambs for slaughter. As this was the only season in which a number of lambs were unsaleable, it was necessary to interpret the results in a different manner from those of the previous seasons.

## *Results*

The results are discussed under the following headings:—(*a*) Incidence of lambing. (*b*) Lambing percentage. (*c*) Lamb Weights. (*d*) Lamb grades and values.

(*a*) **Incidence of Lambing.**—Features of the incidence of lambing in this trial have been:—

1. Despite the fact that mating took place during the hottest months of the year and commenced during a time of rising temperatures and lengthening period of daylight during the first month of mating, a large percentage of ewes became pregnant, lambing was general by the end of April and most of the lambs were dropped within a month of the first lamb being born. These results are typical of lamb breeding in the Mallee districts.

2. Although the reputation held by Border Leicester rams of being slow workers was borne out in 1940 and 1941, they sired lambs which dropped as soon as those by the other two breeds in 1942 and 1943.

Table 4 indicates the incidence of lambing as all lambs were slaughtered together:—

TABLE 4.—AVERAGE AGE, IN DAYS, OF LAMBS AT SLAUGHTER.

| — | 1940. | 1941. | 1942. | 1943. |
|---|---|---|---|---|
| Border Leicester x Merino .. | 124 | 141 | 171 | 163 |
| Corriedale x Merino .. | 128 | 162 | 175 | 162 |
| Dorset Horn x Merino .. | 138 | 161 | 175 | 160 |

Shorn ewe weaners, 6 months old. Corriedale x Merino (left), Dorset Horn x Merino (centre), and Border Leicester x Merino (right).

(*b*) **Lambing Percentage.**—There is little difference between the average lambing percentages of the three breeds over four years from 77 to 80·5 per cent., although there are wide differences in individual years. It is thought that the presence of maiden ewes in the flocks is the main reason for the lower lambing percentages in 1940 and 1941.

(*c*) **Lamb Weights.**—It has not always been possible to conduct lamb weighing at regular intervals owing to the fact that the staff has been reduced and other work has claimed higher priority during the war years.

Nevertheless the following table gives an indication of the relative live-weights of the breeds at comparable periods of their growth in the four years.

The main points of interest in Table 6 are—

1. When born at approximately the same time, as in 1942 and 1943, the Dorset Horn cross lambs gained weight a little faster than the Border Leicester cross during the first three months (i.e., until August), but the latter then put on condition quicker, finishing as heavier lambs in each of these seasons. When the Dorset cross lambs are earlier born, they usually maintain the advantage till slaughter, unless held to be heavy weights.

2. The Corriedale x Merino lambs, even when early dropped, were much lighter than both the crosses with the English breeds.

3. The influence of the seasons, and consequently nutrition on development may be noted in a comparison of the growth rate made in the respective years. The results of good green feed are particularly well shown by the gain in weight between early July and late September of 1941 when ewes and lambs were on green oats for the whole period as compared with 1943 when they were hand-fed until mid-September, because of the drought. In the former year, the gain in weight was twice as rapid as in 1943.

Table 5.—Percentage Drop of Lambs at Walpeup, 1940–1943.

| — | 1940. | 1941. | 1942. | 1943. | Average of Four Years 1940–43. |
|---|---|---|---|---|---|
| | % | % | % | % | % |
| Dorset Horn x Merino .. .. .. | 71·9 | 49·0 | 97·0 | 91·8 | 77·0 |
| Border Leicester x Merino .. .. | 60·9 | 51·9 | 96·8 | 94·9 | 77·0 |
| Corriedale x Merino .. .. .. | 75·0 | 55·2 | 103·9 | 87·8 | 80·5 |
| Average .. .. | 69·3 | 51·1 | 99·0 | 91·5 | 78·2 |

TABLE 6.—COMPARATIVE LIVE-WEIGHTS OF LAMBS (LB.) AT DIFFERENT PERIODS OF THE YEAR.

| Breed. | 1940. | 1941. | 1942. | 1943. |
|---|---|---|---|---|
| | lb. | lb. | lb. | lb. |
| June. | | | 18th June. | 14th June. |
| Border Leicester x Merino .. .. | .. | .. | 33·8 | 27·0 |
| Corriedale x Merino .. .. | .. | .. | 31·8 | 26·0 |
| Dorset Horn x Merino .. .. | .. | .. | 33·8 | 28·2 |
| July. | | 2nd July. | | 8th July. |
| Border Leicester x Merino .. .. | .. | 21·7 | .. | 33·2 |
| Corriedale x Merino .. .. | .. | 29·3 | .. | 31·8 |
| Dorset Horn x Merino .. .. | .. | 32·2 | .. | 34·4 |
| August. | 17th Aug. | 6th Aug. | 1st Aug. | 6th Aug. |
| Border Leicester x Merino .. .. | 51·9 | 40·4 | 57·0 | 39·2 |
| Corriedale x Merino .. .. | 48·8 | 46·6 | 51·8 | 37·7 |
| Dorset Horn x Merino .. .. | 53·3 | 50·4 | 57·3 | 40·3 |
| September. | 17th Sept. | 2nd Sept. | 3rd Sept. | 22nd Sept |
| Border Leicester x Merino .. .. | 66·8 | 57·4 | 71·9 | 55·0 |
| Corriedale x Merino .. .. | 60·5 | 59·5 | 65·2 | 49·6 |
| Dorset Horn x Merino .. .. | 65·0 | 65·5 | 72·3 | 54·2 |
| October. | | 19th Oct. | 4th Oct. | 3rd Oct. |
| Border Leicester x Merino .. .. | .. | 83·6 | 88·3 | 65·8 |
| Corriedale x Merino .. .. | .. | 78·5 | 82·4 | 63·2 |
| Dorset Horn x Merino .. .. | .. | 88·6 | 87·3 | 64·9 |

| Average live weight in paddock just before slaughter 1940–43 (i.e., at last date of weighing). | lb. |
|---|---|
| Border Leicester x Merino .. .. .. .. .. .. .. .. | 76·4 |
| Dorset Horn x Merino .. .. .. .. .. .. .. .. | 76·4 |
| Corriedale x Merino .. .. .. .. .. .. .. .. | 71·2 |

4. Although 1940 was a drought year, the weights of lambs in September compare favourably with those of other years. A considerable area of oats was grazed out to achieve this result, the rate of stocking being much less than in the favourable year of 1941.

(*d*) **Lamb Grades and Values.**—The wether lambs were weighed straight from the paddock and then sent to the works and killed some 40 hours later. The full results are set out in Table 8. All wether lambs, regardless of size and condition, were slaughtered except in 1943, when the following numbers were too small to lift:—Border cross (6), Corriedale cross (15), Dorset cross (9).

The export meat price schedules for 1942 and 1944 are set out in Table 7. The results of the experiment may be translated into money values according to current or anticipated values for each weight and grade, and are shown for the purpose of illustration for these two years.

TABLE 7.—EXPORT MEAT PRICE SCHEDULES FOR 1942 AND 1944.

| Quality. | Weight Range. | Prices per lb. in Pence, Dressed Frozen Weight. | |
|---|---|---|---|
| | | 1942–43. | 1944. |
| | lb. | *d.* | *d.* |
| First D .. | Under 28 | $6\frac{5}{8}$ | 7 |
| 2 .. | 29 – 36 | $6\frac{5}{16}$ | $6\frac{7}{8}$ |
| 8 .. | 37 – 42 | $6\frac{1}{8}$ | $6\frac{13}{16}$ |
| 4 .. | 43 – 50 | $5\frac{11}{16}$ | $6\frac{3}{8}$ |
| Second D .. | Under 28 | $6\frac{7}{16}$ | $6\frac{5}{16}$ |
| 2 .. | 29 – 36 | $5\frac{3}{4}$ | $6\frac{1}{8}$ |
| 8 .. | 37 – 42 | $5\frac{5}{16}$ | $6\frac{1}{16}$ |
| 4 .. | 43 – 50 | .. | $5\frac{5}{8}$ |
| Third L .. | Under 28 | $5\frac{13}{16}$ | $6\frac{1}{4}$ |
| 0 .. | 29 – 50 | $5\frac{7}{16}$ | $5\frac{5}{8}$ |
| | Rejects | $4\frac{3}{4}$ | |

The grades and values of lambs during the experiment are given in Table 9 on page 7.

TABLE 8.—WEIGHTS, GRADES, AND VALUES OF LAMBS PRODUCED AT THE MALLEE RESEARCH STATION—AVERAGE FOR THREE YEARS—1940–1942.

| — | | | Dorset Horn x Merino. | | Border Leicester x Merino. | | Corriedale x Merino. | |
|---|---|---|---|---|---|---|---|---|
| Number of lambs slaughtered | | | 63 | | 78 | | 74 | |
| Average frozen weight | | | 38·2 lb. | | 38·2 lb. | | 32·9 lb. | |
| Percentage frozen to paddock live-weight | | | 45·7 % | | 46·6 % | | 44·6 % | |
| | | | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. |
| | | | | lb. | | lb. | | lb. |
| QUALITY AND GRADE | First | D | 1 | 28·0 | .. | .. | 4 | 26·7 |
| | | 2 | 15 | 33·2 | 19 | 33·5 | 31 | 33·7 |
| | | 8 | 27 | 39·6 | 24 | 39·2 | 17 | 39·0 |
| | | 4 | 13 | 44·9 | 20 | 46·3 | 1 | 45·0 |
| | Second | D | .. | .. | 1 | 22·0 | 9 | 25·2 |
| | | 2 | 6 | 33·7 | 12 | 33·0 | 9 | 32·4 |
| | | 8 | .. | .. | 2 | 38·5 | .. | .. |
| | Third | D | 1 | 28·0 | .. | .. | 3 | 19·3 |
| | | L | | | | | | |
| | | | | s. d. | | s. d. | | s. d. |
| Average value of carcass—1942 schedule | | | | 19 2 | | 19 1 | | 17 0 |
| Average value of carcass—1944 schedule | | | | 21 4 | | 21 3 | | 18 4 |
| Average skin value | | | | 4 3 | | 4 3 | | 4 0 |
| Total value of lamb—1942 schedule | | | | 23 5 | | 23 4 | | 21 0 |
| Total value of lamb—1944 schedule | | | | 25 7 | | 25 6 | | 22 4 |
| | | | | % | | % | | % |
| Percentage of first-grade carcasses | | | | 88·9 | | 80·8 | | 71·6 |

The results for 1943 cannot be included in the averages as all lambs reared were not killable, but the figures for the lambs which were lifted (see Table 9) and live-weights (Table 6) support the general conclusions.

Taking the experiment as a whole it is seen that there is little difference in the return per wether lamb from the Border Leicester or Dorset Horn ram when mated with the Merino ewe. Under the conditions of the experiment, which are typical of a large number of Mallee flocks, the quicker, earlier growth, and greater percentage of first-grade lambs sired by the Dorset Horn are made up for by the better late growth and extra weight of the Border Leicester half-bred lambs. The Corriedale cross lambs were inferior to the British breed crosses. It is emphasized that the experiment and results are for mating with Merino ewes only.


## *Summary*

In 1939 an experiment was commenced to compare the half-bred progeny of strong-woolled Merino ewes mated to three breeds of rams, viz., Border Leicester, Corriedale, and Dorset Horn.

This report deals with the comparison of the wether progeny marketed as export lambs.

The method of experimentation is described. Results are recorded in a manner of value under any future scale of payments.

The results are shown in the accompanying tables. On the average of the three years 1940-42, there has been little difference in the financial returns from the Border Leicester or Dorset Horn half-bred lambs. The Corriedale cross has been inferior to both of the above crosses for this purpose.

Although the Border Leicester cross lambs were usually dropped later than the lambs by the other two breeds in the first two years, this feature was not consistent.

*Satisfactory lambing percentages were obtained by mating in mid-November. The lambing percentages of the three breeds are of the same order for the period under investigation.*

*Although lambs sired by Border Leicester rams were lighter than those of the Dorset Horn cross early in the season, they put on condition later and were heavier by the time of slaughter.*

*The Dorset Horn cross produced the greater percentage (88·9) of first grade carcasses as compared with Border Leicester (80·8) and Corriedale cross (71·6).*

There was no marked difference in the frozen weight to live-weight ratio of the Dorset Horn and Border Leicester cross lambs, but this ratio is lower in the Corriedale cross.

The performance of the ewe progeny of the above crosses as mothers of fat lambs is at present under investigation.

TABLE 9.—RESULTS OF FAT LAMB BREED TRIAL, 1939-40 TO 1941-42.

| | Dorset Horn x Merino. | | | | | | | | Border Leicester x Merino. | | | | | | | | Corriedale x Merino. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1940. | | 1941. | | 1942. | | 1943. | | 1940. | | 1941. | | 1942. | | 1943. | | 1940. | | 1941. | | 1942. | | 1943. | |
| Number of lambs slaughtered .. | 12 | | 19 | | 32 | | 33 | | 14 | | 33 | | 31 | | 38 | | 18 | | 25 | | 31 | | 41 | |
| Average frozen weight .. .. | lb. 32·7 | | lb. 41·4 | | lb. 38·4 | | lb. 23·7 | | lb. 32·8 | | lb. 39·7 | | lb. 39·0 | | lb. 24.4 | | lb. 27.8 | | lb. 35·0 | | lb. 34·2 | | lb. 21·1 | |
| Percentage frozen to paddock live-weight | % 46·1 | | % 46·7 | | % 45·0 | | % 40·0 | | % 47·2 | | % 47·5 | | % 45·5 | | % 38·8 | | % 46·0 | | % 44·6 | | % 43·9 | | % 38·6 | |
| Quality and Weight— | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. |
| | | lb. | | lb. | | lb. | | lb. | | lb. | | lb. | | lb | | lb. | | lb. | | lb. | | lb. | | lb. |
| First Quality D | 1 | 28·0 | .. | ... | .. | ... | .. | .. | .. | ... | .. | ... | .. | ... | .. | .. | 1 | 28·0 | .. | ... | 3 | 26·3 | .. | .. |
| First Quality 2 | 8 | 33·1 | 2 | 34·5 | 5 | 33·0 | .. | .. | 7 | 32·8 | 9 | 34·3 | 3 | 32·6 | .. | .. | 7 | 32·7 | 9 | 34·9 | 15 | 33·6 | .. | .. |
| First Quality 8 | 1 | 39·0 | 9 | 39·9 | 17 | 39·4 | .. | .. | 2 | 39·5 | 11 | 38·8 | 11 | 39 5 | .. | .. | .. | .. | 9 | 39·0 | 8 | 39·0 | .. | .. |
| First Quality 4 | .. | .. | 8 | 44·8 | 5 | 45·0 | .. | .. | .. | .. | 12 | 46 5 | 8 | 46·0 | .. | .. | .. | .. | 1 | 45·0 | .. | .. | .. | .. |
| Second Quality D | .. | .. | .. | .. | .. | .. | 2 | 25·0 | 1 | 22·0 | .. | .. | .. | .. | 1 | 26·0 | 6 | 24·2 | 3 | 27·3 | .. | .. | .. | .. |
| Second Quality 2 | 1 | 32·0 | .. | .. | 5 | 34·0 | .. | .. | 4 | 32·0 | .. | .. | 8 | 33·5 | .. | .. | 2 | 30·5 | 2 | 32·0 | 5 | 33·4 | .. | .. |
| Second Quality 8 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 38·0 | 1 | 39·0 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Third Quality D | 1 | 28·0 | .. | .. | .. | .. | 20 | 24·4 | .. | .. | .. | .. | .. | .. | 29 | 24·4 | 2 | 20·0 | 1 | 18·0 | .. | .. | 16 | 24·1 |
| Third Quality L | .. | .. | .. | .. | .. | .. | 3 | 31·3 | .. | .. | .. | .. | .. | .. | 3 | 30.3 | .. | .. | .. | .. | .. | .. | .. | .. |
| Rejects .. .. .. .. | .. | .. | .. | .. | .. | .. | 8 | 18·6 | .. | .. | .. | .. | .. | .. | 5 | 20·5 | .. | .. | .. | .. | .. | .. | 25 | 19·2 |
| Average value of carcass 1942 schedule | s. d. 17 0 | | s. d. 20 6 | | s. d. 19 3 | | s. d. 10 11 | | s. d. 16 9 | | s. d. 19 2 | | s. d. 19 2 | | s. d. 11 5 | | s. d. 14 4 | | s. d. 18 0 | | s. d. 17 8 | | s. d. 9 2 | |
| Average value of carcass 1944 schedule | 18 6 | | 22 10 | | 21 5 | | 11 10 | | 18 5 | | 22 3 | | 21 5 | | 12 3 | | 15 7 | | 19 8 | | 19 5 | | 9 6 | |
| Average skin value .. .. | 4 3 | | 4 3 | | 4 3 | | 3 0 | | 4 3 | | 4 3 | | 4 3 | | 3 2 | | 4 0 | | 4 0 | | 4 0 | | 3 5 | |
| Average price per lamb 1942 schedule | 21 3 | | 24 9 | | 23 6 | | 13 11 | | 21 0 | | 23 5 | | 23 5 | | 14 7 | | 18 4 | | 22 0 | | 21 8 | | 12 7 | |
| Average price per lamb 1944 schedule | 22 9 | | 27 1 | | 25 8 | | 14 10 | | 22 8 | | 26 6 | | 25 8 | | 15 5 | | 19 7 | | 23 8 | | 23 5 | | 12 11 | |
| Percentage of First grade carcasses .. | % 83·3 | | % 100 | | % 84·4 | | % Nil | | % 64·3 | | % 95·6 | | % 71·0 | | % Nil | | % 44·4 | | % 76 | | % 83·9 | | % Nil | |

# Superphosphate Rations—1944-45

THE superphosphate rationing plan for Victoria for the current year (1944-45) was announced recently by the Director of Agriculture, Mr. H. A. Mullett. Unless the man-power shortage at the fertilizer works is relieved, Mr. Mullett points out, manufacturers will be unable to convert into superphosphate the full quota of phosphatic rock allocated to Victoria for this year. If sufficient man power is made available, the ordinary ration for non-priority crops and pastures will be double that of last year, equivalent to one-half of normal usage. The supplementary ration for dairying and irrigated pastures will be the same as for last season which, together with the ordinary ration, provides a total quota approximately equal to normal usage.

However, in view of the possibility that the full amount will not be manufactured, it has been found necessary, for the time being, to limit deliveries to two-thirds of the full ration, except in cases where the ration does not exceed 4 tons, or where the fertilizer is for priority crops.

No special rations are to be allotted for cereal hay, nor for any additional wheat acreage to be sown in 1945 under temporary licence. Where the full quota for the wheat farm, however, does not provide a dressing of one bag to 6 acres (= 31 lb./ac.) over the wheat acreage normally sown with superphosphate (not the full licensed acreage) the grower may apply for an adjustment of his ration. Wheat growers and all other farmers who desire to apply for an adjustment of their ordinary ration for the year ending June, 1945, must lodge their applications with the Fertilizer Section, Department of Agriculture, 81 Collins-street, Melbourne, not later than 28th February, 1945.

The superphosphate ration for orchardists will be 1 cwt. per acre for the area under fruit trees and vines, and, as in the past, special allotments of fertilizer will be issued for vegetables, potatoes, flax and other priority crops. Application for these special rations should be made on the priority crop form.

Farmers must order their superphosphate from the same company or distributor from whom they purchased their supplies last year. Many growers can now obtain their total ration for the year, and others a considerable portion of their full quota. In their own interests, farmers are urged to lodge their orders immediately and take delivery at the first opportunity, so that the limited transport available can be used to the best advantage.

# THE POTATO MOTH

Hot, dry weather conditions increase the danger of attack by the grub of the potato moth. Losses from this cause can be considerable because tubers damaged by the grub may not be marketed. Growers therefore are urged to take adequate precautions to reduce damage to a minimum.

A measure of control of the moth may be gained by moulding late in the season. As some four inches of soil are necessary to secure protection from the grub, the mould or hill should be broad, with the soil thrown well around the bases of the plants, so that all cracks are filled in.

At harvest time the tubers should be bagged immediately after digging. To leave them lying exposed, even for one hour, may result in serious infestation developing at a later stage. It is strongly recommended that bags be sewn and removed from the paddock as soon as possible. If this is not convenient, bags of potatoes should be covered with spare sacks until cartage can be arranged.

The practice of placing potato tops on the bags to protect the contents from the sun cannot be too strongly condemned, as grubs which are present in the tops are placed in contact with the tubers and will cause further damage.

[Contributed by the Agricultural Division.]

# Twenty-Five Per Cent. of Bobby Calves Slaughtered Last Year were Heifers

By J. T. KELLY, B.Agr.Sc., Science Field Officer

Bobby calves unloaded at North Melbourne railway siding awaiting transport to the abattoirs.

EACH year about 300,000 calves are slaughtered in Victoria. A large proportion of these are bobby calves, the term "bobby" being used to differentiate the newly born calf from older and heavier calves which are usually classed as vealers. Bobby calves are marketed soon after birth.

The accompanying table shows that the number of calves slaughtered is highest during the late winter and spring months when cows in Victorian dairying districts are coming into production. During this period most of the calves slaughtered are bobby calves.

The figures for July, August, and September of this year are considerably higher than they have been for a number of years and this would suggest that a larger proportion of heifer calves than usual has been slaughtered and consequently, fewer heifers are being reared. This assumption is supported by the butchers who estimate that, in the past, heifer calves represented from 5 to 15 per cent. of all calves slaughtered, whereas figures of calves slaughtered in July and September, 1944, and given later in this article, show that the number of heifers slaughtered had risen to 25 per cent.

NUMBERS OF CALVES SLAUGHTERED EACH MONTH—JULY, 1941, to OCTOBER, 1944.

| — | 1941–42. | 1942–43. | 1943–44. | 1944–45. |
|---|---|---|---|---|
| July .. | 36,925 | 32,723 | 28,197 | 28,627 |
| August .. | 38,259 | 40,388 | 37,751 | 56,507 |
| September .. | 37,125 | 40,325 | 43,617 | 46,797 |
| October .. | 28,007 | 30,618 | 35,432 | 35,176 |
| November .. | 18,003 | 20,175 | 26,263 | .. |
| December .. | 19,341 | 9,953 | 16,721 | .. |
| January .. | 14,041 | 13,908 | 15,506 | .. |
| February .. | 15,493 | 14,432 | 12,884 | .. |
| March .. | 20,572 | 17,696 | 17,793 | .. |
| April .. | 18,924 | 26,252 | 18,710 | .. |
| May .. | 31,857 | 20,989 | 22,259 | .. |
| June .. | 21,802 | 19,146 | 22,054 | .. |
| Total .. | 300,349 | 286,605 | 297,187 | .. |

The maintenance of the dairy cattle population depends on the rearing of sufficient heifer calves to replace cows lost to dairy herds through deaths, and culling for disease, old age, low production, and other causes. Fears for the future expansion and even maintenance of the dairying industry have recently been expressed

as a result of the large number of heifer calves being slaughtered and which will not be available for replacement purposes.

A survey was carried out recently to obtain some idea of the percentage of heifer calves being slaughtered for human consumption and the figures are set out hereunder. The table shows the number of calves known to have come from each Victorian district, together with the number and percentage of heifers over a period of four weeks in July, and a similar period in September, 1944. Congestion at the abattoirs often resulted in calves from different districts being yarded together. These have been listed as " mixed ".

| District. | Total Calves. | Heifer Calves. | Percentage Heifer Calves. |
|---|---|---|---|
| Gippsland .. .. | 8,829 | 2,246 | 25 |
| Western District .. | 4,491 | 1,021 | 23 |
| Northern Districts .. | 2,315 | 642 | 28 |
| North-East .. | 950 | 244 | 26 |
| Central .. .. | 272 | 63 | 23 |
| Mixed .. .. | 9,695 | 2,355 | 24 |
| Total .. .. | 26,552 | 6,571 | 25 |

As revealed in the figures, 25 per cent. of the calves inspected were heifers. At this rate, approximately 75,000 of the calves slaughtered this year for human consumption will be heifers. This large number of heifers added to those killed on farms as underweight calves, the number that died natural deaths between birth and two years, and sterility in young stock indicates that there may be a shortage of heifers for replacement purposes in the near future.

Unfortunately there are no previous figures with which to compare the results of this survey, so that the extent to which the slaughter of heifer calves may have increased is not known; neither is it possible to obtain an accurate estimate of the numbers of heifer calves destroyed on farms. The amount of loss experienced between the birth of the calf and the stage when it should normally come into production has been investigated on a small scale in New Zealand, and is referred to in the Annual Report of the New Zealand Dairy Board, 1939–1940. The information obtained indicates that the total loss between approximately one month after birth and two years of age is about 10 per cent. and a further 5 per cent. prove not in calf at two years of age.

Three main reasons for the increase in slaughter of heifer calves have been suggested. These are :

(1) Shortage of fodder on dairy farms in districts where an unfavourable season has been experienced.

(2) Replacement of cattle by sheep which farmers in the drought-affected northern districts have been forced to sell cheaply.

(3) Many farmers have stopped rearing calves because they are now selling whole milk instead of butterfat. Although, in these circumstances, skim milk is not available, the calves could be successfully reared on substitutes.

A number of light-conditioned calves, older than the bobby type, was being forwarded for slaughter during September. This was particularly noticeable with stock from the North-East, and suggests that farmers had intended to keep these animals but were forced to sell them as the unfavourable season continued. The percentage of heifers from this district rose from 22 per cent. during the July inspection to 31 per cent. in September.

The third reason for the increase suggests that farmers, in an endeavour to produce the maximum quantity of milk per acre at the present time, are failing to realize that continued high production depends on the availability of sufficient young stock for replacement purposes; but dependence for their replacements on dairy-farmers with skim milk is not a sound policy. These farmers after catering for their own needs may wish to use surplus skim milk for growing pigs and not the rearing of additional heifer calves, and in any case will desire to retain the best heifers and offer the remainder for sale. Because of the need for continued high production of dairy produce over an extended period, it is imperative that all dairy farmers rear sufficient heifers to ensure that their herd shall be maintained at the highest possible level of production at the minimum cost.

# Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

### *Dairy Cows*

ALTHOUGH the season has been very unfavourable in many districts, total production of dairy produce is within 1 per cent. of what it was at this time last year. This is a creditable performance, but unless there is a cool, wet summer, dairy farmers will have to use increased skill and efficiency to prevent a tailing off in production during the remainder of the year.

In the late summer, and in the autumn and winter months, farmers will be faced with the greatest fodder shortage for many years. Reserves of hay have not been replenished in full during the recently completed harvest, and there will be keen competition between horse owners, sheep raisers, and dairy farmers for whatever supplies are available.

In most dairying districts, sufficient fodder in the form of hay and silage has been conserved by the majority of farmers for use on the farm. Those farmers, however, who have decided to buy hay or chaff, may not be able to locate supplies. On account of the shortage of straw, poultry farmers will be on the market for increased supplies of hay which will provide litter and some grain for the birds.

Bran and pollard comprise the bulk of the concentrates fed to dairy cows. Supplies will be down more than one-third on last year, and the demand will be greater. If adequate transport, including shipping, can be made available wheat will be available, but protein-rich feeds, which are required to balance the rations, will be scarcer than ever. Linseed meal is produced in relatively small quantities only. Peanut meal is not reaching Victoria. Meat-meal is supplied first for feeding to poultry, then for pigs and, if any is over, it may be sold for feeding to dairy cows.

So far, the picture is not a bright one, but with careful feeding and proper rationing, there should be sufficient feed to produce the quantities of dairy produce, eggs, and pig meats required by the Commonwealth Government.

Dairy cows, and other stock should be checked over to ensure that no unprofitable animals are retained a day longer than is necessary. Under the present conditions of feed shortage where no feed is being wasted, a dry cow costs up to 10s. a week to feed, as she will eat the equivalent of 1 to 1½ cwt. of hay. Culled cows should not be retained as any anticipated rise in normal market values will not equal feed costs.

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Quality pigs bred and reared on one farm

As a general guide on which to ration out the feed, the following basis may be used where dry paddock feed is available:—

Give cows yielding less than 1 gallon of milk daily a mere handful of the cheapest feed.

Give all other cows 1 kerosene tinful of good-quality chaff, or its equivalent in good-quality hay twice a day, and 4 lb. of concentrates for each gallon of milk produced above the first gallon per day. Thus a cow producing 3½ gallons of milk would receive 1 kerosene tinful of chaff and 5 lb. of concentrates in the morning and the same in the evening.

This is a basis only, and each farmer must work out the exact quantities for each cow. Some cows will produce more milk if they are given less hand feed, as they prefer grazing. Other cows are poor foragers in the field, and prefer hand-feeding.

It is a common practice to feed all cows the same quantity of feed. This practice is inefficient, as the low producer may get too much feed and put on unnecessary condition, while the high producer may not get sufficient, and she drops away both in milk yield and in condition. All feed should be fed individually to cows in proportion to the amount of grazing in the paddocks and to their milk yields. If fed too much in the bails, paddock feed will be tramped and wasted instead of grazed.

Where paddock feed is dry and sufficiently abundant to enable a cow to graze her fill, she should produce at least 1 gallon of milk per day. Cows giving this quantity, or less, should require a mere handful of bail feed to encourage them into the shed and to stand quietly while being milked. The quantities to feed to the heavier milkers will depend upon the feeds available. Good quality hay or silage could comprise the bulk of the extra feed required by cows producing up to 3 gallons of milk per day, but beyond that, cows will require a liberal supply of concentrates to maintain production during the next seven months.

Where hay is fed and paddock feed is dry, protein deficiency will be hard to avoid. Succulent green pasture pickings supply ample protein, stimulate the appetite, and increase production, but it is hard to replace the feed usually fed in the bail. In some countries root crops and silage are used extensively to replace green pastures, but on account of the labour costs of handling these foods in Victoria they are not used extensively.

Various concentrate mixtures may be used, but on dry pastures the following should give good results:—

| Ingredients. | Mixtures. | | | | | |
|---|---|---|---|---|---|---|
| | 1. | 2. | 3. | 4. | 5. | 6. |
| | lb. | lb. | lb. | lb. | lb. | lb. |
| Ground wheat .. | 100 | 100 | 100 | 100 | 100 | 100 |
| Pollard .. .. | 100 | 100 | .. | 50 | .. | .. |
| Bran .. .. | 100 | 100 | 100 | 50 | .. | .. |
| Linseed Meal .. | 40 | 75 | .. | 20 | 60 | .. |
| Meat Meal .. | 10 | .. | 20 | 10 | .. | 20 |

With green paddock pickings good results should be obtained with only half of the linseed or meat meals, and where the pastures are luscious these ingredients may be reduced still further.

### *Wisdom Acquired from Experience in Pig Raising*

"A man who buys store pigs and buys his food is working for the other fellow; if he breeds his pigs or grows his food he might make a living, but if he breeds his pigs and grows his food he will make money."

That statement was recently made to the writer by a Victorian farmer who claims a long and varied experience of pig raising. It crystallizes much of what has been spoken and written about the economics of pig production, and expresses it in such a practical fashion that many other pig raisers should see in the quotation much to think about in relation to their own enterprise.

In some circumstances it pays to buy store pigs, but generally it is a practice to be avoided, because the cost of marketing and transporting store pigs and the check to their growth, which is usually caused through their changed conditions and journey through market and the risk of infections, all tend to increase the cost of producing pig meat.

Under some conditions the purchase of part or even the whole of the food required by pigs is good business, but generally the foods grown and fed on the same farm are the most economical, because transport and marketing costs of the foods are eliminated.

The function of pigs in agriculture is primarily that of salvagers of by-products, waste, and surpluses of foods produced on farms.

[L. A. Downey, H.D.A., Pig Expert.]

## *Bees*

When moving the apiary any distance, care has to be exercised in packing populous colonies and more especially care is needed in the use of the migratory cover. It is advisable to reduce populous hives before migration, as it is much better to arrive at the destination with a normally strong colony in good condition than with a populous one suffering travel damage and injury.

Now that the Red Gum flow is about finished, it is possible in favoured districts to reduce populous colonies by increasing the number of colonies and building them up on stringy bark and other early autumn flows.

A three-frame nucleus can be drawn from the over-populous colonies and movement (or migration) of the original colony can be carried out during daylight, as the flying bees will return to the nucleus which is left on the old stand. Queen cells can be raised or laying queens purchased in preparation for the increase.

By making an increase, two things are achieved, first, the populous colonies have been assured of safe movement by being relieved of their surplus bees and, second, an early increase has been made with ample time for the nuclei to build up before the autumn flow finishes.

As mortality in bees has been heavy in Victoria during the last twelve months, large increases will be resorted to by many apiarists in favourable districts.

When making an early increase it is a wise plan to divide half the colony only, keeping the other half as a safeguard against adverse conditions that may arise after the nuclei have been formed.

The increase can be made by using a lesser amount of brood and bees for each nucleus and, when the queens are laying, the nuclei can be built up to wintering strength with brood, bees, and stores from the undivided colonies.

If adverse conditions arise after making a large increase in the colonies it is a worrying problem to tide them over a lean period, but when only half the colonies have been divided, the full strength colonies with ample stores on hand can be drawn upon to assist the nuclei with stores, bees, and brood.

More uniform nuclei and better divisions can be made if the divisions (original colonies) are moved beyond the flight distance of the bees from the original location. Also, the bees do not drift, as is often the case when the operation is carried out without movement.

If preparation is made for dividing by getting the required material in place, and the hives of the nuclei set out on their stands to receive the brood and bees, the full colonies to be used can be divided and moved before the bees make their location.

[W. A. Collins, Apiary Inspector.]

## *Poultry*

With the present difficulty in obtaining the varieties and quantity of poultry foods necessary for maintaining good health and high egg production, good general management is more important than ever, as a number of errors might result in failure. The birds themselves, their surroundings and nutrition, each require thought and attention under abnormal conditions.

There is ample evidence to show that, even when disease is at its worst, there are always some survivors, and in experimental work it has also been observed that some families tend to be more resistant to disease than others. This should not be overlooked, and there are many

other important qualities which birds intended for egg production should possess, and, therefore, a careful selection of this resistant breeding stock from year to year is, obviously, of vital importance in reducing sickness and mortality amongst the flock to a minimum.

Routine work of cleaning must not be neglected, and the removal of litter from the pens at regular intervals, to prevent parasitic infestation, is of the utmost importance.

It is safe to say that on correct feeding depends, in the main, the success or otherwise of any undertaking connected with live stock, and poultry farming is no exception. Of course, attention has to be paid to accommodation and general surroundings, but correct feeding is essential. Every endeavour should be made to encourage the birds to eat the necessary amount of food for their normal upkeep, plus that required for a constant supply of eggs as possible. To do this, when all varieties of cereal foods are unobtainable, except wheat, the system of feeding may occasionally be varied. Under the circumstances, it is most necessary for the ration to be supplemented with varieties of green food, which may include lawn clippings consisting of grasses and clovers, and any other form of suitable foods available, such as milk, &c. When wheat only is available more protein is required, and this can be supplied by adding 7½ per cent. of meatmeal to the evening and morning rations, or by allowing the birds free access to a separate hopper containing meatmeal.

[H. F. Clinton, Poultry Expert.]

# Tubercle-free Herds

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

| Name. | Address. | Number in Herd. | Name. | Address. | Number in Herd. |
|---|---|---|---|---|---|
| Aboriginal Station .. | Lake Tyers .. .. | 109 | Maloney, P. J. .. .. | Tongala .. .. | 66 |
| Armstrong and Son .. | Wangaratta .. .. | 105 | McNabb and Son, G. A. | Irrewillipe East .. | 154 |
| Ballarat Orphanage .. | Ballarat .. .. | 105 | Nancarrow Bros. .. | Kerang .. .. | 47 |
| Banyule Stud Pty. Ltd. .. | Wangaratta .. .. | 54 | Noonan, G. .. .. | Benalla .. .. | 31 |
| Black, I. S., Estate .. | Mount Noorat .. | 53 | Noonan, Mrs. S. A. .. | Benalla .. .. | 35 |
| Cribbes, T. .. .. | Wangaratta .. | 39 | Northcote Children's Farm | Bacchus March .. | 165 |
| Deering, J. T. .. .. | South Wangaratta .. | 61 | Onley, W. H. .. .. | "Glenholme," Caldermeade | 67 |
| Dennis, Mrs. A. A. .. | Frankston .. .. | 23 | | | |
| Dookie Agricultural College | Dookie .. .. | 85 | Parker, Mrs. L. M. .. | Tallarook .. .. | 67 |
| Geelong Grammar School | Corio .. .. | 78 | Payne, A. E. T. .. | "Yarra View," Lilydale | 66 |
| Gorman, A. W. .. | "Cathcart," Alexandra | 57 | Payne, T. E. N. .. | "Woodburn," Kilmore .. | 44 |
| Griffin, G. W. .. .. | Gladysdale .. .. | 49 | Poole, M. A., and D. .. | Caldermeade .. .. | 155 |
| Griffiths, J. G. .. .. | Benalla .. .. | 121 | Poole, M. A., and D. .. | Yannathan .. .. | 79 |
| Henry, J. A. .. .. | Warrnambool .. .. | 41 | Powell, T. S. .. .. | "Carellen," Mansfield .. | 43 |
| Howlett, Mrs. G., and Miss E Samuel | Land Lang .. .. | 55 | Richardson Bros., Messrs. | "Faldinghurst," Upper Beaconsfield | 30 |
| Jakobi, L. W. .. .. | "Granada," Yannathan | 82 | School of Horticulture .. | Burnley .. .. | 6 |
| Kane, F. E. .. .. | Warrnambool .. .. | 28 | State Experiment Farm .. | Ruthergien .. .. | 37 |
| Kilmany Park Farm Home for Boys | Sale .. .. .. | 105 | State Research Farm .. | Werribee .. .. | 245 |
| Lady Talbot Milk Supply Co. | Cranbourne .. .. | 479 | Stephens, Dr. F. .. | Vermont .. .. | 32 |
| Lawrence, P. H. .. | "Rainga," Tarrawarra .. | 83 | Vagg, T. R. .. .. | Officedale .. .. | 45 |
| Longerenong Agricultural College | Dooen .. .. | 48 | Wells, W. G. .. .. | Caldermeade .. .. | 65 |
| | | | Woodyer, P. A. .. | Mornington .. .. | 19 |

In addition to the above-mentioned herds there are 807 commercial dairy herds containing 20,386 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 442 herds in which 12,472 head of cattle have passed one test, and may be considered, therefore, to be in process of becoming tubercle-free herds.

# PIG MANGE AND THE PIG LOUSE

By E. MURRAY PULLAR, M.V.Sc., Veterinary Research Institute, Melbourne University

## *MANGE*

MANGE in its severe form is probably well known and readily recognized by any pig breeder. The affected skin is rough and thickened, the hair matted and usually broken off short, and the surface of the skin is covered with a well-defined layer of yellowish or brown scabs (Figs. 1 and 2). The parts particularly affected are the butt of the tail and the adjacent part of the back, the head (ears and snout), and feet. Although the disease may become established anywhere on the skin, in very young animals the whole of the skin may be affected, and in such cases the condition is often fatal.

It is not generally realized that mange in a mild form is not uncommon, particularly in older pigs. In these cases the skin appears dry and harsh, with very little hair, and scab formation is not marked. The lesions may be confined to the butt and tip of the tail, and the edges of the ears. It is not clear why these mild cases do not progress further, but it is considered that the natural resistance of the more mature animals, combined with the custom of applying oil to the skin to control lice, keeps the parasites in check to some extent. These lightly affected pigs are a menace to the herd because they act as a source of infection for the clean stock. Litters raised by infected sows usually begin to exhibit evidence of infection at or about weaning time, when resistance to infection appears to be at its lowest.

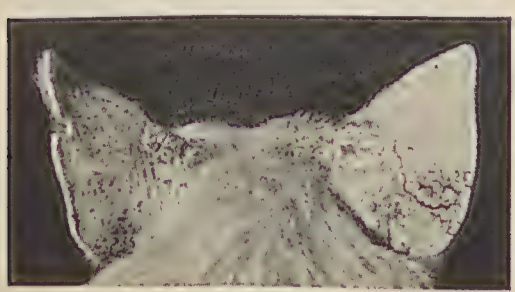


Fig. 1—Mange on the head and ears of a pig. The normal pink healthy skin is covered with a thick layer of yellowish brown scabs.

Fig. 2—Mange on tail of a pig. All the hair has fallen out and the skin is covered with thick yellowish brown scabs. The mange is spreading up the middle of the back also.

### *Cause of the Disease*

Mange results from the infestation of the skin by a small spider-like creature known as a mite. When fully grown this parasite is about one-hundredth of an inch long, just too small to be seen with the naked eye.

The body of the mite (Fig. 3) is rounded and flattened, like a lentil. There are four pairs of legs, two pairs being attached close together, well forward on the under surface of the body, and projecting forwards and outwards; the other two pairs of legs being attached behind the middle of the body and projecting backwards and outwards. In general, the legs are very short and stumpy. In fact the second last pair of legs are so short that they only just reach the edge of the body. At the tip of each leg there is either a bell-shaped suction cup on a short stalk, or a long hair-like bristle. Both are used to grip the skin while walking.

The mite has no eyes, and it is provided with several rasp and pincer-like structures (mouth parts) with which it tears the skin. It feeds on the torn fragments and the tissue juice, which exude from the broken surface.

### *Life Cycle*

The mites, males and unfertilized females, live under the scabs on the skin. After fertilization by the males, the females commence to tunnel or burrow into the skin. In these tunnels they lay their eggs. Compared with the size of the mite the eggs are very large, being about half as long as the body of the female (Fig. 4).

In the dark, warm, and moist surroundings of the tunnel the eggs develop and hatch in about four days. The baby mite which emerges from the egg is known as a *larva.* In appearance it differs from the older mites in that it has only three pairs of legs. The larva crawls out on to the skin where it hides under the scabs and feeds on fragments torn from the skin, and pus and fluid which exudes from the broken surface.

The baby mite or larva grows all the time. As its skin is hard and will not stretch, it eventually reaches a stage when it can grow no further. Then, like a crab or any other hard-shelled insect, it must cast its outer coat and grow a new one; this is called moulting.

The new form, which emerges from the shell of the larva, is known as a *nymph,* and is provided with eight legs. The nymph, which lives and feeds like the larva, in turn stops growing after a few days, and passes into a resting stage and then moults. From the cast skin of the nymph the fully-developed male or female mite emerges. The mites mate on the surface of the skin, and the fertilized females begin to prepare fresh tunnels. Thus the life-cycle is completed.

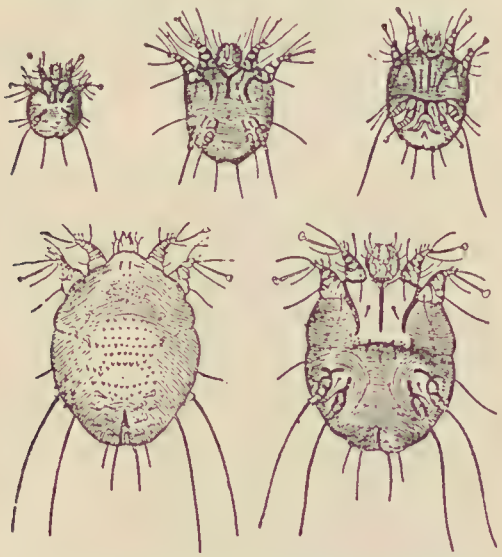


Fig. 3—Mange mites in various stages of development. Top, left to right: larva, nymph, adult male (all seen from under surface). Lower: adult females (upper surface left; under surface right).

Fig. 4—Adult female mange mite. Two eggs are clearly visible through the body wall. The eggs are extremely large compared with the size of the mite.

Each female mite lays from 10 to 25 eggs. These hatch in 3 or 4 days, and the mites pass through the several stages in their development and become mature and start laying eggs in from 10 to 12 days. The complete life cycle takes about 15 days.

It has been estimated that a single pair of mites could, in six generations (i.e., two to three months) produce 1,500,000 descendants.

### *Harm Done by the Parasites*

The mites exert their harmful effect in three ways:—

1. *Injury to the Skin.*

Mangy pigs are less attractive to the buyers for two reasons. First because the injured, scabby skin spoils the appearance of the pigs and, secondly, when the carcasses are dressed and the scabs removed in the process of scraping, the underlying skin looks red, angry, and raw. Badly affected animals have to be skinned and used as choppers, and so bring a lower financial return.

2. *Irritation.*

In an attempt to allay the irritation caused by the mites the pigs will bite themselves, or rub against stones, fence posts, &c. They will not infrequently bite or rub so hard that they tear their own skins, and extensive and deep bruising may be caused. These secondary injuries further reduce the value of the carcass, and if the wounds become infected with pus-forming bacteria, life itself may be endangered.

3. *Loss of Sleep and Condition.*

A more serious and less obvious effect is the loss of condition occasioned by irritation and loss of sleep.

Animals utilize the food they eat in two ways, first to provide energy to carry out ordinary bodily functions such as walking, eating, &c., and secondly to build up and replace the tissues of the body. If the food supply falls off, or the animal requires more energy for maintenance and work, the food intended for body-building is diverted and the animal fails to grow. In the case of a rapidly-maturing animal like the pig, this is very important, as not one ounce of food can be spared from body building.

In a lightly-infested herd it was found that the pigs required twice as much food to make 1 lb. gain in weight as they would under normal circumstances. This observation makes it clear why heavily-infested animals fail to grow at all, and even at times lose weight.

## *How Infection Spreads*

Mange is an infectious disease, and can only arise by the transference of mites or their eggs from a diseased animal to a healthy one. As the mites are unable to fly, this limits infection to direct or indirect contact.

Direct contact occurs when pigs are close together for a sufficient length of time for mites to crawl from one to another. Pigs huddled together on a sleeping platform provide ideal conditions for the spread of infection.

Indirect contact is theoretically possible, but in actual practice it is not of very great importance. In this case mites or their eggs are detached from diseased pigs and lodge on the sides of sties or in bedding, later coming in contact with healthy animals using the same sties.

It is not known exactly how long mange mites will live once they have been removed from the host, but as they are killed by sunlight and the drying action of air, they survive probably only for a few days.

## *Control Measures*

The first and most important point to remember is that mange is an infectious disease, and must be treated as such. If infection is discovered in a herd it is essential to examine thoroughly every pig in the herd and place in isolation every pen in which infected animals are found. This segregation of the contacts as well as the infected pigs is important, because the contacts may be incubating the disease, and they may re-infect the herd at a later date.

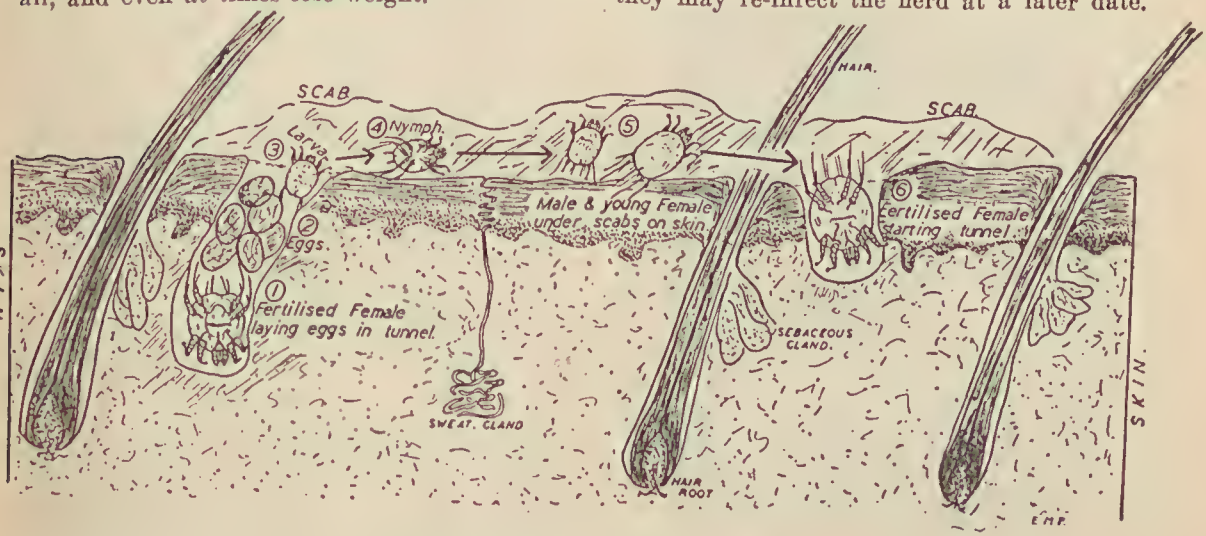



Fig. 5—Life cycle of the mange or scab mite.

Having taken these measures to limit or stop the spread of infection, the next step is to treat the diseased animals. The labour involved can be considerably reduced by eliminating all cases in which the trouble and expense would not be justified. Such cases fall into the following categories:—

(1) Lightly-infected porkers and baconers almost up to market weight.
(2) Sows and boars which should be culled in any case because of other faults.
(3) Runts and other badly-infected animals in poor condition.

Those in groups 1 and 2, and a few in group 3 should be sold for immediate slaughter. The remainder of group 3 are destroyed on the farm, as they have no residual value, and because they seldom make satisfactory growth after a severe setback.

Mange is a disease which readily responds to treatment; in fact, an occasional animal will make a spontaneous recovery without treatment. The following preparations have been used with varying degrees of success:—Sheep dips (arsenical, carbolic, and cresylic), tincture of iodine, sulphur ointment and other sulphur preparations, and even sump oil.

An ideal treatment must be—

(*a*) Cheap.
(*b*) Sure in its action.
(*c*) Non-poisonous, i.e., harmless to patient and operator.
(*d*) Simple to prepare and apply.
(*e*) Not spoiled by storage.

Fig. 6—The knapsack spray pump, as used for treating large herds. *Agric. Gaz. N.S.W.*

There is no known treatment which will destroy the eggs of the mites unless it is so severe in its action that it will also injure the skin of the host. For this reason it is necessary to repeat the treatment after a lapse of time long enough to permit all the eggs to hatch, but short enough to kill the newly-hatched mites before they can lay a fresh batch of eggs. This period has been fixed at four (4) days. In actual practice it is found that it is necessary to give a third treatment after another period of four days to kill the few mites which may have survived the second treatment.

### *Treatment*

| Ingredients. | Quantity. | Cost. |
|---|---|---|
| Neatsfoot Oil .. | 1 quart .. | @ 5/6 gal. = 1/5 |
| Clear Soft Water | 2 quarts .. | — — |
| Washing Soda .. | 2 Teaspoonsful | — — |
| Potassium Sulphurata | 1 ounce .. | @ 6/– lb. = –/5 |
| | | Total for 3 quarts 1/10 |

DIRECTIONS.

Place the lumps of washing soda and *potassium sulphurata* in the water in a suitable container, such as a kerosene tin, and bring it to the boil. When the solid ingredients have dissolved, *take the tin off the fire,* and slowly pour in the oil stirring all the time. The oil emulsifies at once producing a milky white solution which does not settle out. The mixture can be used as soon as it is cool or stored until it is required. It should never be prepared or stored in an enamel container as it will blacken the enamel.

Neatsfoot oil can be purchased from any general store, saddler, or leather merchant. *Potassium sulphurata* must be bought from a chemist. It should be kept in an air-tight container, otherwise it will take up moisture from the air and turn into a sticky mess.

### *Method of Application*

The most satisfactory method of applying mange dressing is by means of a spray pump. For all except very large herds, the type known as the "Brass Continuous Atomizer" (see Fig. 7) is quite suitable. This type of pump costs about 10s. 6d. in Melbourne, and can be purchased from the larger stores, or from florists' or orchardists' suppliers. The spray liquid is

placed in the circular container below the pump, and it is forced out through the jet by pumping air into the container. There is very little wear in this type of instrument, and with reasonable care and regular cleaning it will last for years.

More elaborate pumps of the Knapsack type can be used (see Fig. 6), but as they cost from £4 to £6 this expense would only be justified if large numbers had to be treated every day, and the pump kept in continuous use.

The easiest method of applying the dressing to small porkers and larger pigs is to run them into a small drafting yard, about 5 ft. square. A corner or portion of a pen or drafting race blocked off with a hurdle is quite satisfactory. In such a confined space the pigs will stand quite still without any further restraint.

The emulsion should be sprayed *all over the pig,* particular attention being paid to all obviously affected parts, the bridge of the nose, butt of the tail, feet (inside and outside surfaces), and *inside* the ears. The emulsion does not irritate the eyes, so that the head can be sprayed as well as the rest of the body. *Do not spray directly into the eyes* as the force of the jet might injure them. If the spray is commenced slowly the pig will close its eyes, and it is then safe to proceed with the full force of the jet.

Suckers and small slips are best treated with an assistant holding them up by the hind legs. After the body and head are sprayed the assistant takes the pig by the shoulders while the hind legs are treated.

When treating an infested herd do not attempt to do too many animals at once. Time will only be wasted if it is impractical to repeat the treatment at the correct interval (four days). It is much better to start on a small portion of the herd and cure them completely, then later start on another group. By this means it will be possible to rid the herd from infection without dislocating the working of the farm. One man can treat 15 to 20 pigs in an hour, and it is suggested that not more than one hour be devoted to mange control in any one day.

### *Further Control Measures*

After the pigs have been given three, or possibly four, treatments there may be a few which have not responded very well, or are not growing at a satisfactory rate. It is more economical to sell these for whatever they will bring, rather than go to further trouble and expense.

Fig. 7—The hand spray pump, as used in the average sized herd. This type of pump is known as the "Brass Continuous Atomizer."

*Agric. Gaz. N.S.W.*

On a clean, well-kept piggery it should not be necessary to treat the surroundings, as the sunlight, fresh air, and mange dressing carried back to the pens on the pigs' skins will be all that is necessary. On badly-kept premises, thorough disinfection, combined with an improved standard of animal husbandry will be necessary.

After the disease has *apparently been eradicated* it is a wise precaution to treat all sows prior to farrowing, and the suckers before weaning. This should be made a routine for at least six months after the herd has been regarded as clean, because the disease may be retained in the herd by an occasional animal with very small lesions.

In addition, a thorough examination of the herd in which early signs of infection are looked for should be made at regular intervals. Particular attention should be paid to the butt of the tail, feet, bridge of the nose, and inside the ears. This regular inspection should be made at intervals for at least six months. It is a good idea to select a fixed time to make this inspection, such as the first of the month, otherwise it may be forgotten.

## *THE PIG LOUSE*

The pig louse *Haematopinus suis* (Fig. 8) is well known to all pig breeders. It is a small six-legged, wingless, insect which when fully grown, is an eighth to one-quarter of an inch long. Like most lice it is restless, and easily seen climbing through the hair, particularly on the back in the region of the neck. To enable them to remain firmly attached to their hosts their legs are provided with large hook-like claws for clasping the hair.

### *Life Cycle*

After the females have been fertilized they lay a number of eggs, which are cemented on to the pig's bristles. These eggs are quite large, and can be seen with the naked eye as small yellowish or white sand-like grains.

After two to three weeks the eggs hatch, and the young lice emerge. These baby lice, although very much smaller, are similar in build to the adults. They commence feeding immediately by piercing the skin and sucking blood. After about 10 to 12 days they are fully grown. Lice live for about a month, and each female lays about 90 eggs during her lifetime.

Pig louse (*Haematopinus suis*).
Enlarged 10 times.

### *How Lice Spread*

The usual method of spread is by direct contact. The lice are very active, and will readily climb from one pig to another, particularly when the animals are huddled together at night.

Lice may spread from pig to pig by indirect contact, that is, live lice or eggs may fall off infected pigs into the bedding and later climb on to clean pigs. This method of infection is not common as it is not easy to detach lice or eggs from the hair, and if they are detached they do not live for long away from their animal host; they die in a few hours, and the eggs will live for a few days only.

### *Harm Done by Lice*

The lice pierce the skin and suck blood like a mosquito. Their bites appear to be very painful and itchy, and infested pigs are continually rubbing themselves against posts, &c., to relieve the irritation. While scratching themselves the animals may cause considerable injury to their skins. The most serious financial loss to the farmer is the slower growth and fattening rate of infested pigs, due to loss of sleep and waste of energy in scratching and rubbing.

### *Control*

It is an easy matter to kill lice by suffocation. This can be done by plugging the breathing pores on their skin with oil or oily emulsions.

Before the war, sump oil was commonly used for this purpose. By means of a white-wash brush a stripe of oil about 4 inches wide was painted down the middle of the back from ears to tail. The oil would spread itself over the skin.

While this method was satisfactory in most cases it was inclined to scald or irritate the skin, and made the pigs and their surroundings very greasy and dirty. Other oils may be used in this way, but all suffer from the same disadvantage. Furthermore, at present, sump oil is difficult to obtain in quantity.

In 1940, Carse (*Agricultural Gazette* of New South Wales, July, 1940, page 357) described the use of an emulsion made with neatsfoot oil for control of lice. The directions for the preparation of this emulsion are given earlier in this article under the heading, "Treatment of Mange." In the case of lice, however, it is not necessary to add the *potassium sulphurata*.

Unlike sump oil this emulsion has a soothing effect, and at the same time cleans the skin and leaves it in a better condition.

As no known treatment will kill the eggs without injuring the skin, it is necessary to repeat the treatment every 7 to 10 days until the pigs are free from infection. In this way the lice that have hatched out of the eggs will be killed before they can start laying a fresh batch.

# AGRICULTURAL LIME

## Its Use and Effects on Soil

By W. R. JEWELL, M.Sc., Agricultural Research Chemist

A country limestone quarry, where large quantities of agricultural lime are produced.

THE practice of liming the soil is one of the oldest operations in agriculture. In countries which have been farmed for centuries the present fertility of certain soil types is due largely to this practice. In newer countries the necessity for liming is not so apparent, and lime is not used on such a widespread scale. A few years ago there was a marked local increase in the use of lime for agricultural purposes, and this interest in lime in Victoria has been maintained, at least to a certain extent. This may be due partly to an awakening by the farming community to an interest in the results obtainable from liming, partly to an active campaign on the part of firms marketing agricultural lime, partly to the fact that fertilizers are at present not freely available, and partly to the fact that agricultural lime costs less per ton than fertilizers. Some farmers believe that they can save on their fertilizer bill by substituting lime for, say, superphosphate. In some cases they have been led to this wrong conclusion by certain vendors of agricultural lime who have claimed that lime is a fertilizer and can be used in the place of superphosphate. This is not so, however, as will be explained later in this article.

The awakened interest in agricultural lime has been reflected in the numerous inquiries received from farmers as to whether lime is likely to be of benefit to their particular soil, whether it can replace fertilizers, and what is the best form of lime to use. There has been a tendency on the part of a few salesmen to push the sale of lime, irrespective of whether it is likely to be of value to the particular farmer or not, and even in districts where the soils are already amply supplied with lime, and where the addition of further lime would be equivalent to carting coals to Newcastle. Further, in some cases extravagant claims

have been made for particular brands and types of lime. While lime definitely has its function to perform in agriculture, in view of the foregoing remarks it seems desirable to deal briefly with the general question of the use of agricultural lime, and the limitations as to its function, and also to clear up any misconceptions existing in the minds of prospective users.

### *Forms of Lime*

Lime may be applied to the soil in a number of different forms, as outlined below:—

**Quick Lime**, otherwise known as lime oxide, burnt lime, caustic lime, or lump lime, is obtained by the burning of limestone rock in lime kilns. This form of lime, when applied to the soil, rapidly becomes slaked, due to the absorption of moisture either from the soil or from the atmosphere, or from both, and then reverts to the state of carbonate of lime, in which it existed before it was burnt. Any virtue it has lies in the fact that, if well burnt, it naturally falls into a fine state of subdivision, and some of it is soluble. Therefore it may act with greater rapidity than some other forms of lime. Quick lime possibly may have an immediate detrimental action when applied in that, because of its caustic nature, it may adversely affect organic matter and some forms of bacteria that may be present in the soil. In Victoria, quick lime for agricultural purposes usually is sold in a ground condition, which ensures more even distribution. Ground lime, however, quickly absorbs moisture, which makes storage without deterioration difficult.

**Slaked Lime** or lime hydroxide is formed when quick lime is acted on by water, either applied direct or taken up from the atmosphere, and is usually in a fine state of subdivision. Slaked lime is not as caustic in its action as quick lime, and, because it is more soluble in water than calcium carbonate, it may have a more rapid action on the soil, and be of particular benefit to heavy clay soils. Slaked lime, however, like quick lime, rapidly absorbs carbon dioxide from the air, and readily reverts to the carbonate form after application to the soil.

**Carbonate of Lime** or ground limestone is the unburnt limestone ground to a fine powder. The term also includes soft lime, marl, chalk, shells, &c. Generally speaking, carbonate of lime is as suitable as other forms of lime, and, in some circumstances, has advantages, provided it is sufficiently finely ground and reasonably free from impurities. It is not harmful in heavy dressings, is less unpleasant to handle and apply, and can be stored indefinitely without fear of deterioration or destruction of the bags. When considering the suitability of ground limestone, the degree of fineness is of paramount importance, particularly when the source of supply is a hard, dense rock. Sea shells, which are really calcium carbonate, frequently remain unaltered in the soil for years. In the same way, large lumps of rock limestone will be of very little value as a liming material; the only process of disintegration of calcium carbonate in the soil is that of solution. When the source of supply is a soft natural limestone, fine grinding is still essential, but the degree of subdivision need not be so great as with a hard limestone rock. In the case of the softer material, moisture can pass through the small lumps and thus hasten solution. There is evidence to suggest that limestone rock should be so ground that all the material passes through a 40-mesh sieve and that at least 90 per cent. should pass through a 100-mesh sieve. With ground soft limestone it is desirable that all the material should pass through a 10-mesh sieve.

**Waste Lime Products.**—In addition to the common forms of lime mentioned above, waste lime products are at times available from certain industrial processes. In some cases, the product is a relatively pure form of carbonate of lime, when it may be sold as such without any reference to its origin. Lime is also obtained as a waste by-product from calcium carbide used in acetylene production. This material is mainly in the form of hydroxide or carbonate (depending on its age) and is suitable for agricultural purposes, provided it has aged sufficiently to ensure the removal of impurities which might be harmful to plant life; it should never be used when fresh, but only after exposure to the weather.

Another waste product is the lime-press cake from a beet-sugar factory, limited in Victoria to the Maffra district only. However, at the price for which this material is available, it is an excellent source of agricultural lime for farmers in the immediate neighbourhood.

Waste tannery lime contains ingredients (including sulphides) which are injurious to plants. Such material should not be used for agricultural purposes until exposed to the air for many months.

### *Relative Values*

In most cases there is little to choose between the ultimate effects of various forms of lime, and as calcium carbonate properly ground is as suitable as other forms, and in some respects more advantageous, it seems, on the face of it, an unnecessary expense to go to the trouble of burning it for agricultural purposes. These various forms of lime, however, contain different amounts of actual lime (calcium) oxide. It will be apparent, therefore, that different amounts of each will be required to supply the same amount of lime per acre to have the same effect on the soil. Roughly speaking, 56 lb. of burnt lime is equivalent to 75 lb. of slaked lime, and each of these is equivalent to approximately 100 lb. of ground limestone. Hence, approximately 1¾ to 2 tons of ground limestone or carbonate of lime would supply as much effective "lime," and have the same neutralizing effect, as 1 ton of quick lime.

It would appear, therefore, that the ultimate basis on which to assess the value of various brands and forms of agricultural lime is on the price per "unit of lime" oxide distributed on the farm. By "unit of lime" is meant each 1 per cent. of calcium oxide per ton of material. For example, relatively pure burnt lime must cost less than approximately twice as much as ground limestone on the farm, if it is to be preferred to the latter. Again, in some cases, very impure limestones or marls may be more economical than pure ground limestone, provided the former can be obtained and distributed at a lower cost per unit of lime. It is essential, therefore, that the lime content should be known, together with the cost per ton landed on the farm, before it is possible to determine which of several types is the most economical. When comparing different brands of the one type of lime, the matter is a little simpler. For instance, if one brand of ground limestone contains 95 per cent. of calcium carbonate and can be obtained for say, 25s. per ton on the farm, then any other brand containing less than this amount of calcium carbonate cannot be as economical unless it can be obtained at a proportionately lower price, assuming, of course, that the degree of subdivision is satisfactory in both samples.

### *Control of Sale of Lime*

The sale of agricultural lime is controlled by the Agricultural Lime Act. Each bag of lime must carry a label which shows the name and address of the manufacturer, the brand and type of lime, and an analysis. The actual content of calcium oxide must be stated, together with the form (oxide, hydroxide, or carbonate) in which it occurs and its equivalent in terms of calcium carbonate. Most limestone contains a small amount of magnesium carbonate, which remains as magnesium oxide after burning and as hydroxide after slaking. The amount of magnesium oxide present must also be shown in the analysis on the label. Fineness of grinding is of great importance, therefore the proportion of the material passing through a 20-mesh sieve must be stated, as an indication of the degree of fineness.

The Act also requires that an invoice certificate, showing the quantity purchased and the analysis, &c., must be supplied with each lot of lime sold. A list of all registered brands, together with analyses and prices per ton, is published each year in this Journal. This list will be found useful in assessing the relative values of different brands available, along the lines already indicated. The farmer should not purchase an unregistered brand nor accept delivery of any agricultural lime not labelled as required by the Act.

### *Effects of Lime on Soil*

Lime performs a number of functions in the soil, which are briefly dealt with hereunder:—

1. Probably the most important effect of lime on soil is the correction of soil acidity. It has been established that many crops and plants will not reach maximum production when the reaction of the soil is lower than a certain degree of acidity. For instance, sugar beet and lucerne prefer a soil with a somewhat alkaline reaction. Wheat, and most grasses and cereals, do equally well over a range of soils from slightly acid to slightly alkaline. Potatoes, on the other hand, do best in decidedly acid soil. When considering the desirability of liming, the type of crop to be grown, therefore, has some importance. Lime, of course, reduces soil acidity by neutralizing the acids present, and the amount of lime necessary will depend on the degree of acidity, soil type and the crop to be grown.

2. Lime is an essential plant food, and the addition of lime may be necessary to remedy a deficiency of that material in the soil. That is to say, apart from the effect of soil reaction

itself on plant growth, there may be insufficient lime present to supply the plants' normal requirements; under these conditions, lime would be necessary apart from any correcting of soil acidity. Some plants, e.g., legumes, lucerne, &c., have a greater requirement for lime than have other crops. Lime is a constituent of all crops, and their removal, either directly, or indirectly through stock, reduces the lime status of the soil. Further and larger amounts of lime are lost from soils by leaching with rain water, charged with carbon dioxide.

3. Lime can have a beneficial effect on most heavy clay soils, making them more friable and open. It has a flocculating action, causing very fine particles of clay to flocculate together into larger particles, resulting in a much better physical texture. It has been claimed that lime also has a beneficial action in closing up light sandy soils, but the effect of any such action is probably negligible.

4. Liming, by reducing soil acidity, may improve the bacterial activity in the soil, and also, to a certain extent, may increase the availability of other plant foods present in the soil.

### *Lime is Not a Fertilizer*

Lime is of value for the reasons outlined, and it performs so many functions that it is usually referred to as a soil improver. Although it supplies lime as a plant food, lime should not be considered as a fertilizer in the general sense of the term, nor can it take the place of the usual fertilizers, in spite of certain types of sales propaganda to the contrary.

A farmer must realize that he applies lime to correct certain soil conditions, but, if a soil be deficient in say, phosphoric acid, no amount of lime can make up this deficiency, and some form of phosphatic fertilizer is essential, whether lime is used or not. Again, in most instances, lime to be of benefit must be applied very much more heavily than is the case with fertilizers. Lime has its place in agricultural practices, but not as a substitute for fertilizers.

### *Lime in Victoria*

As suggested earlier in this article, the need for lime in Victoria is not as pronounced as in certain other countries of different climatic conditions, and where agriculture has been practised for centuries. While the necessity for liming in Victoria is limited, there is little doubt that there are large areas which would benefit by the application of lime. Whether such benefit would be economical or not depends largely on the degree of improvement obtained and on the price of lime; with the relatively heavy applications required, lime must be very much cheaper than at present before it could be economically applied on many large areas. Apart from soils used intensively (as in market gardening), where the necessity for lime has a special significance, most of the areas likely to be benefited by liming lie south of the Dividing Range and more particularly in Gippsland. This naturally follows because, generally speaking, the higher the rainfall the more acid the soil. Most of our northern soils and those of the Wimmera have an alkaline reaction and are amply supplied with lime. With few exceptions, little result is to be expected from liming in these areas.

It seems rather amazing that any salesman should attempt to sell lime in certain districts in which they have been active, and still more amazing that farmers in these districts should be persuaded to buy lime for their land. In some of our northern soils, where sodium predominates in the clay complex, the addition of lime is not only unnecessary, but may be actually harmful.

A few instances have been met with in which acidity was so pronounced that satisfactory growth was not obtained until after heavy liming, but it should be noted that lime will not always give an economical return even on soils which one would expect to respond to liming. Farmers who propose to use lime, therefore, are advised to try a small area first and to notice the results before deciding to lime on a large scale. Experimental plots, which include trials with lime, have been established by the Department of Agriculture in a large number of centres, and farmers should look to the Department, and to experiments in their own districts or to those nearest their farms, for evidence as to whether liming is likely to be economically beneficial under their conditions.

In addition, the degree of acidity of a soil sample will be determined for farmers, together with advice as to whether liming is indicated, for a nominal fee of 2s. per sample. Samples of agricultural lime will be analysed for lime content for farmers for the same nominal fee per sample. All such samples, and any inquiries regarding lime, should be forwarded to the Chemist for Agriculture, Department of Agriculture, Melbourne, C.2.

# TRANSFERRING OF BEES

By J. THOMLINSON, Apiary Inspector

IN transferring a colony of bees from one situation to another, from a hollow tree for example, or the cavity between the studs of a weatherboard house to a modern frame hive, the operator will be well advised to employ the natural instinct of the bee to his own advantage. Once a colony of bees becomes thoroughly alarmed, the individual members rush to the honey cells, and gorge as much honey as they can possibly carry. Seeming to realize the possibility of the destruction of their home they concentrate on securing a sufficient supply to enable them to make a fresh start should the necessity arise. Bees gorged with honey become less active, and may be driven from the combs with very little risk of the operator being stung. On the other hand, if the colony be disturbed without creating the necessary sense of alarm, the bees may become vicious, and put up a vigorous fight in defence of their stores. To bring the colony to a state of submission, a steady stream of smoke should be directed on to it. In the case of a box hive, smoke at the entrance would be sufficient, but in the walls of a house, where the combs are probably a distance of some feet from the entrance advantage must be taken of every possible means of directing smoke into the cavity in which the colony is situated before removing the boards.

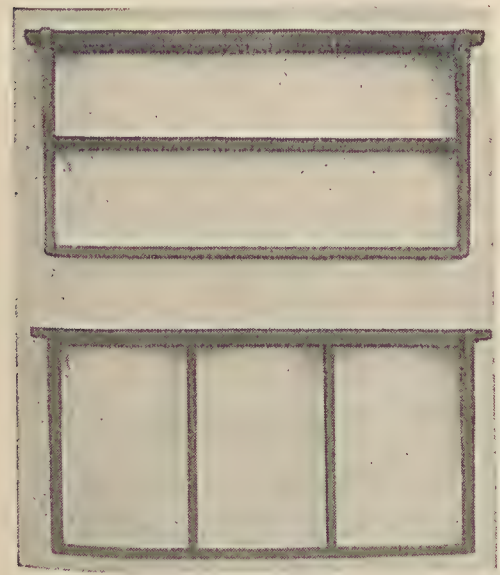


Fig. 1—Frames fitted with wooden partitions to hold small pieces of brood comb.

The transfer may be carried out at any time. But in the event of local conditions being unfavorable for the gathering of nectar in sufficient quantities for comb building and the storage of a reasonable surplus of honey.

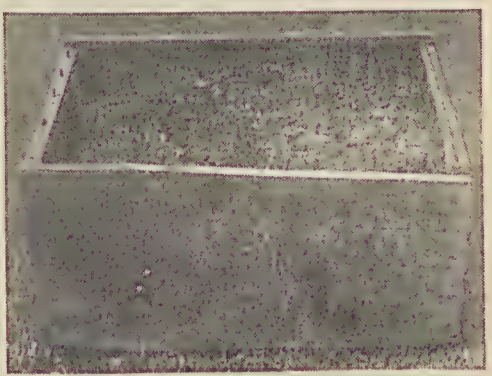


Fig. 2—Box Containing bees removed from stand and placed bottom upwards.

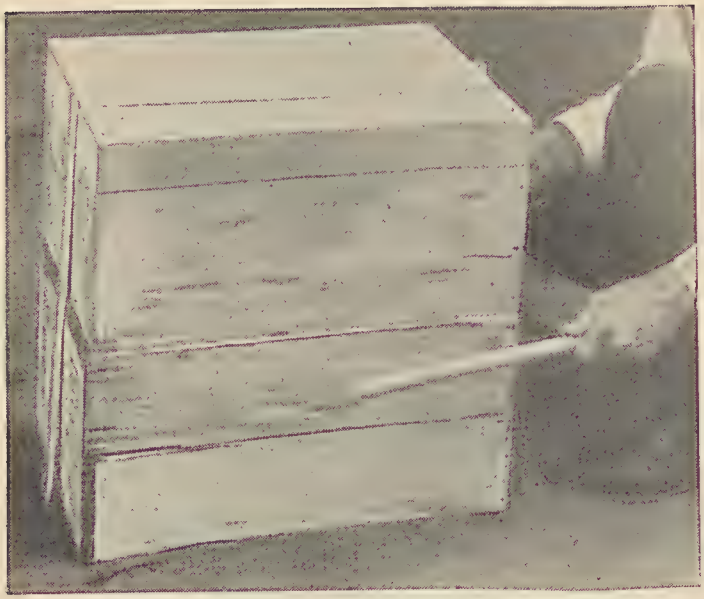


Fig. 3—Drumming the bees from comb in a box hive.

partitions as shown in Fig. 1; a ball of string at least 30 feet long; a hammer, chisel, and a pair of pliers, if working on a box hive, also necessary tools if the colony is located in the wall of a house; a bucket containing water to keep the hands and implements free from honey, and a long-bladed knife for removing combs, and fitting the brood into frames. Should the colony be located in a box, place the nozzle of the smoker near the entrance, and direct a strong cloud of smoke well into the centre, working the bellows for about ten or fifteen seconds. Step aside for about half a minute, then raise one end of the box, and again use the smoker, directing the smoke between the combs. Lower the box, and after a period of one minute remove it to a convenient situation close at hand, placing it bottom upwards as in Fig. 2. If considered necessary a few puffs of smoke may be used again. Then place a box of the same width and length as the one containing the bees on top of the inverted combs, and nail a cleat at each end to keep it in position (Fig. 3). With a short stick in each hand lightly beat, or drum as it is termed, the sides of the box containing the bees. The drumming should be continued for about fifteen minutes, by which time the majority of the bees

the colony must be fed, or assisted with frames of comb containing honey. Transferring, generally speaking, is best carried out during early spring, the work being completed while the Cape weed is still in bloom, and before the combs become laden with honey. Combs laden with honey are difficult to handle, and consequently retard the work.

Before commencing to transfer a colony of bees, the operator should make certain that all necessary material and implements are at hand. These should comprise a complete hive with frames wired and fitted with comb foundation; a lighted smoker, and fuel for recharging; two frames fitted with wooden

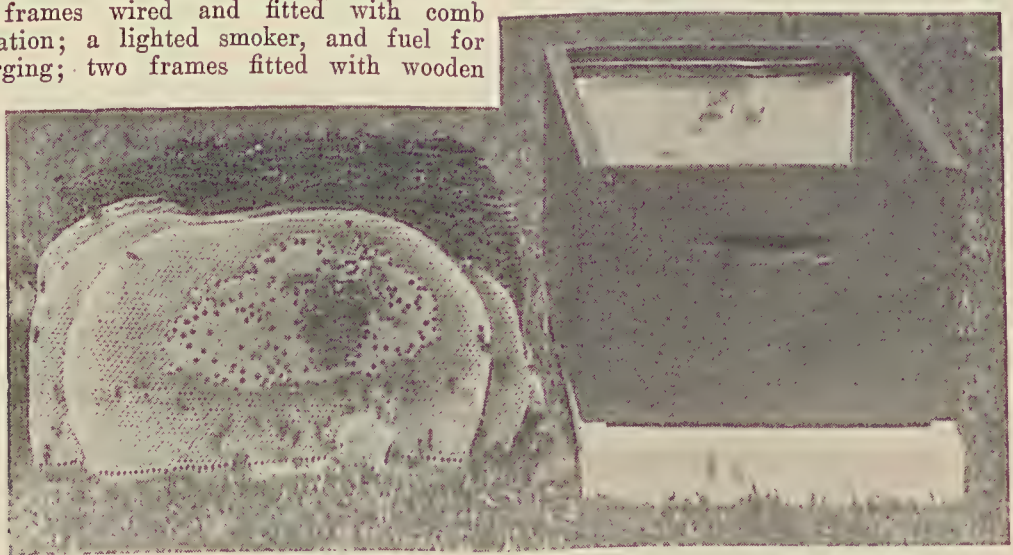


Fig. 4—Sides and ends of box removed exposing combs, and hive in position to receive transferred brood.

Fig. 5—Top box removed, showing bees.

should have deserted the combs and retired to the top box. The cleats should now be removed, and one end of the box raised to note progress. If the bees have not left the combs, replace the cleats, and continue drumming, but if the bees appear to have retired to the top box (Fig. 5), it should be removed and placed in position in the old stand, raising one end with a small chock to allow bees on the wing to gain admittance.

Fig. 7—Bees dumped in front of hive containing transferred brood.

Under normal conditions the dismantling of the box and transferring of the brood may be proceeded with on the spot, but should there be a number of colonies of bees in the vicinity, and a scarcity of bloom, it will be necessary to complete the work under cover. Much inconvenience may be caused by strange bees attempting to take the exposed honey, therefore the work should be completed, and exposed honey removed as soon as possible.

To detach the combs from the sides and ends of the box, pass the blade of a knife completely around the inside, keeping it close to the wood, then with the aid of the chisel, hammer, and pliers remove the sides and ends exposing the

Fig. 6—Brood fitted and tied into frames.

comb, as in Fig. 4. To remove the combs from the remaining portion of the box, take hold of the top of the nearest with the fingers of the left hand, using a knife in the right hand to detach it from the wood. Stray bees should be brushed from each comb as it is removed. A long quill or small branch with a cluster of leaves will serve the purpose if a brush is not available.

Empty combs and combs containing honey should be placed on one side, while those containing brood should be fitted in frames, which previously have been placed close at hand, as follows:—First cut four pieces of twine each 24 inches in length, lay them on a flat surface about 3 inches apart. Place the empty frame on top of the strings, then cut the brood to fit neatly into the frame, taking advantage of the frames fitted with wooden partitions to hold

Fig. 8—Driving the bees into the box.

the smaller pieces (see Fig. 1). As each frame is filled with brood, tie the ends of the string tightly over the top bar (Fig. 6), and place in the hive. The quantity of brood in a box hive will vary according to the strength of the colony and local conditions, but four frames should accommodate the brood from the average box. When completed, they should be moved to the centre of the hive, and the balance of the frames already wired and fitted with comb foundation, placed on each side. Arrange a mat on top of the frames, and fit the lid. The hive is then ready to receive the bees. Move the box containing the bees to one side, and spread a sack or sheet of strong paper on the spot from which it was removed. Place the hive on the sack or sheet with the entrance facing in the same direction, and as near as possible in the same position as that of the original box. Take the box containing the bees, and with a sharp jolt dislodge them within a few inches of the hive entrance (Fig. 7); then with the aid of the smoker drive them into the hive, using a small stick or twig to prevent clustering (Fig. 8). If this precaution be not taken, the bees may cluster over the front of the hive, completely blocking the entrance, causing delay, and possible loss of the queen. During this operation the smoker should be used with discretion, an occasional light puff being all that is necessary.

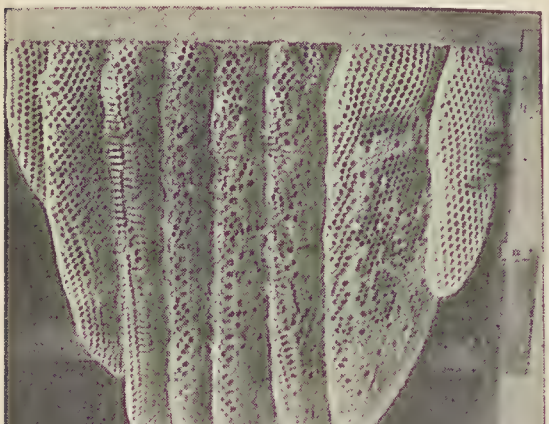


Fig. 9—Lining boards removed exposing combs of colony located in a cavity between the studs of a balcony.

Fig. 10—Brood transferred to frames and replaced in cavity.

Honey taken from the box and stored in old brood combs hardly justifies the loss of time and trouble necessary to render it fit for the table, but it may be returned to the bees by the following method:—Install a super or second story on the hive. The combs containing the honey should then be stood in a small box or other receptacle, a wedge being fitted between each comb to allow free access to the bees. Put the box inside the super on top of

the frames, taking the precaution to see that the lid is perfectly bee tight, otherwise robbing may be encouraged. When the honey has been removed by the bees, the super and receptacle containing the empty combs should be taken away. The hive should be opened within a week, and the brood comb examined. Under normal conditions, it will be found that the comb has been repaired and securely attached to the frames, in which case the string should be removed. As the colony progresses and new comb is built, the original comb taken from the box should be discarded by placing the frames containing new comb in the centre of the hive, and gradually working the old comb to the sides, removing it and replacing with frames fitted with comb foundation, when convenient.

To transfer a colony of bees from the hollow of a tree or part of a dwelling house, the foregoing principles would apply, but a considerable variation in method may be necessary. In Fig. 9 a colony of bees is shown located in a cavity between the studs of a balcony wall. The lining boards have been removed, exposing the comb. In this instance, while removing the comb, the queen and majority of the workers have been dispersed, escaping through spaces caused by the overlapping of weatherboards on the outside. To have attempted to follow the bees would have meant the removal of weatherboards from the outer wall. To avoid this, the brood was fitted into frames, and replaced in the cavity from which it was taken (Fig. 10). A sack was then placed over the cavity to exclude the light, and smoke directed into the spaces where the bees had taken refuge. The bees returned and formed a cluster over the brood (Fig. 11). The frames and brood, with bees attached, were then placed in the hive.

Fig. 11—Bees returning to brood.

When transferring a colony of bees from a dwelling, the hive should not be removed until nightfall. Where possible, a clear day should elapse before the removal in order to allow field bees and stragglers to find the hive; otherwise inconvenience may be caused for some days by those left behind.

# Broodiness in Poultry

Broody hens are sometimes used by small poultry-keepers and householders to hatch a few chickens, but to the commercial farmers who do all their hatching in the incubator, they are a nuisance.

Light breeds such as White Leghorns, Anconas, Minorcas, &c., seldom go broody, whereas in the heavy breeds such as Australorps, Rhode Island Reds, Light Sussex, &c., broodiness is usually fairly prevalent. This is probably why the White Leghorn is the most popular breed with the large commercial poultry farmers. The work entailed in handling "broodies" certainly takes a great deal of time and egg production of the flock is seriously affected in the meantime.

If broody hens are allowed to remain in the nests for several days they are much harder to "break off the cluck," and also quickly lose condition, which means a longer period out of production. They also cause overcrowding in the nests and an increase in the number of cracked and broken eggs.

Remove the hen immediately she becomes broody to a broody coop or spare pen in which there are no nests and where she can be fed and watered. She should be back into production again in ten days to a fortnight, but if allowed to remain on the nest, many weeks of production will be lost.

Some hens go broody only once in the year, others many times. It is advisable to mark persistent broodies with a coloured leg band so that they can be culled out early and not used for breeding purposes.

[Inserted by the Live Stock Division.

# TETANUS IN ANIMALS

By G. NICOL, B.V.Sc., Veterinary Officer

TETANUS or lockjaw is a disease which occurs commonly in horses and sheep, although all animals are susceptible. It is caused by a germ, the tetanus bacillus and this micro-organism has the ability to form spores which can survive for long periods under natural conditions when protected from direct sunlight. Tetanus spores are commonly present in manure of animals, and in consequence heavily-manured pastures are more infected than virgin soils. Similarly, sheep-yards and shearing sheds in which manure has been allowed to accumulate are likely to harbour tetanus germs in large numbers. Infection with tetanus may follow when spores are introduced into wounds caused during castration, shearing, lamb marking and other operations. Tetanus spores do not spread throughout the body, but if conditions are favourable they multiply at the site of infection and produce a toxin or poison which attacks the nervous system, producing very marked symptoms.

### *Symptoms in Horses*

A slight stiffness with consequent slight alteration in gait may be the only initial symptom. This rapidly becomes more marked and the animal adopts a trestle-like stance and is unable to turn round or does so with difficulty. The tail is raised and the muscles of the thigh, shoulder, loin and neck are hard to the touch. The nostrils may be dilated and the lips drawn back from the teeth. Respiration becomes rapid and shallow, the pulse small and hard. Sweating in patches over the body may be quite marked. There is marked excitability and an increased sensitivity to sound and light, and if the animal is disturbed the muscles are thrown into spasms and the animal may fall to the ground. Where the jaw muscles are involved, it is impossible to open the mouth ("lock-jaw"), mastication ceases and dribbling of saliva may be seen. Lifting the head upwards results in the third eyelid (the pinkish, fleshy membrane at the inner corner of the eye) being forced across the eye (*membrana nictitans* reflex), this being a very useful diagnostic sign. For the most part there is no effort made to lie down, although if the ainmal goes down, the condition is usually fatal, complications such as pneumonia, asphyxia with exhaustion supervening.

In a small percentage of cases, local symptoms only may be evident, for example, muscular spasms may be confined to an area about the site of infection or to one limb only.

### *Symptoms in Sheep*

Unlike horses, sheep usually tend to lie down when affected. There are similar muscular symptoms to those seen in horses, the legs being held well apart, resulting in a proppy gait followed by the animal lying on its side with head thrown well back, legs extended and held straight out from the body. The fleshy eyelid is commonly seen half-way across the eye. Deaths frequently occur about the fourth day after infection but may vary from three to twenty days.

### *Treatment*

The poison or toxin which is produced by the tetanus organisms acts on the central nervous system and its effect usually cannot be combated once pronounced symptoms are evident. With valuable animals injections of large doses of tetanus anti-toxin are often made with the aim of neutralizing any further toxin produced. Due to the large doses involved, the cost of such treatment is prohibitive for use on any but the most valuable of animals. Sedative drugs may be used in conjunction with the injections of anti-toxin to alleviate muscular spasms. If treatment of a valuable horse is attempted along these lines, the patient should be placed in a darkened loose-box, the floor of which is covered with suitable bedding, preferably sawdust, but not straw. Slinging is useful in some cases. Where early symptoms only are in evidence, it is often possible to administer a purgative and also soft foods such as gruels or bran mashes. Maintenance of quiet is important; plugging of the ears with cotton wool is very useful to deaden noise.

### *Prevention*

(*a*) **Attention to Wounds.** — Deep-seated wounds are ideal for the multiplication of the tetanus organism. Hence it is important that all wounds should be thoroughly cleansed and disinfected. Inoculation of tetanus spores into wounds occurring in operations such as castration and docking, can be avoided by ensuring that instruments are sterilized before use and the operation performed under conditions of strict cleanliness. If possible, instruments should be sterilized in boiling water for fifteen minutes; failing this, they should be first washed and then immersed in a strong solution of lysol (10 per cent.) for 30 minutes.

Marking of lambs should be done in the open in temporary yards and the lambs then placed in clean paddocks. Shearing cuts should be dressed with a suitable antiseptic lotion.

(*b*) **Stable Management.**—Regular cleansing of stables, proper disposal of manure from horse yards and attention to likely sources of injury such as projecting nails, are useful precautionary measures. Special care should be taken with the hooves of horses to prevent cracking, by use of knife and rasp. Seedy toes and thrush should be treated by scraping to expose normal horn.

(*c*) **Shed Hygiene.**—Shearing sheds should be cleansed by sweeping with a hard broom, using hot water and a small amount of caustic soda, and spraying the walls with a spray pump. Removal of accumulations of dead wool and faeces from sheep yards, branding race, counting out pens, together with possible watering of the yards will help considerably to reduce contamination with tetanus spores.

(*d*) **Use of Tetanus Anti-toxin.**—Tetanus anti-toxin is prepared by immunizing horses against the toxin of the tetanus bacillus. Under normal circumstances, when animals become infected with tetanus spores, the response of the body is not sufficient to produce sufficient anti-toxin to neutralize the toxin being formed at the wound site.

An injection of tetanus anti-toxin almost immediately makes available to the animal a means of neutralizing the toxin being formed.

Dangers of post-operative tetanus may be avoided by the injection of anti-toxin just before the operation. The amount for horses is one dose, containing 500 units (U.S.A.) while for sheep is one dose containing 100 units (U.S.A.). The immunity from such a single injection lasts from two to three weeks, which is usually adequate to protect the subject concerned. In other words, this immunity will usually cover the period during which either sheep or horses are likely to develop tetanus. In areas where in previous years all hygienic precautions have been taken and losses from tetanus are still very heavy following either shearing or lamb marking, inoculation of the flock may be carried out at the same time as shearing or lamb marking.

(*e*) **Use of Tetanus Toxoid (Alum Precipitated.**—By the use of tetanus toxoid it is possible to actively immunize both sheep and horses against tetanus. Dose rate for horses is 10ml., for sheep, 1ml. Immunity is not developed until approximately fourteen days after injection so that it is not suitable for use where an operation is to be performed immediately or where an injury has already been sustained. On the other hand, it has the advantage that where an operation can be delayed for fourteen days a more lasting immunity is given than is possible with tetanus anti-toxin. A second injection of toxoid at the end of twelve months will give permanent immunity.

(*f*) **Use of Tetanus Anti-toxin and Tetanus Toxoid Simultaneously.**—Laboratory tests have shown that tetanus anti-toxin and toxoid can be used simultaneously to immediately protect an animal against tetanus and to confer a relatively lasting immunity at one handling. The anti-toxin is injected at one site and the toxoid at another (for example left and right thighs respectively). What occurs under these circumstances is that the anti-toxin confers an immediate immunity, while at the end of fourteen days the toxoid has had time to produce a more permanent immunity. Further field trials are required before recommendations can be given on this procedure.

### *Summary*

Advanced cases of tetanus give little hope of recovery.

Early cases of tetanus often respond to adequate nursing measures and the use of tetanus anti-toxin.

Preventive measures are particularly important in areas where losses from tetanus occur frequently, and are based on proper shed and stable hygiene, attention to wounds and the use of either tetanus anti-toxin or tetanus toxoid.

# IN THE ORCHARD

Contributed by the Horticultural Division

### *Peach Rust*

PEACH rust is a frequent cause of loss in canning peaches in the Goulburn Valley when conditions favourable to its development occur. Infection of leaves is indicated by numerous small reddish-brown pustules. On the fruit, small depressed areas of a darker green than the rest of the fruit may appear at this time of the year. Growers should carefully examine their trees for any sign of infection. To control any further damage, apply a spray of dry mix lime sulphur. This is made by mixing together 16 lb. of dusting sulphur, 8 lb. finely-ground slaked lime and 1 lb. lime casein spreader, and adding to 100 gallons of water. The agitator in the spray vat should be working efficiently, in order to keep the mixture in suspension. A spray later in the season may be required if further infection appears.

### *Woolly Aphis*

In some seasons, woolly aphis multiplies rapidly, and damages lateral growth on apple trees before the parasitic wasp is able to control this pest. This seems to be due to the fact that early in the season, weather conditions which suit the aphis do not favour development of the wasp. A careful examination of the clusters of aphis will show whether the parasite is active by the presence of black shells with holes in them which represent the dead bodies of aphis from which the parasite has emerged. The parasite is almost universally associated with the aphis, and unless infestation is severe, spraying should not be necessary. Should infestation become particularly severe, however, a spray of 1 pint of nicotine sulphate in combination with either 3 lb. soft soap or 1 gallon summer white oil emulsion may be applied now. It is desirable, however, to delay using this spray, because it may destroy parasite as well as aphis.

The use of a spray of red oil emulsion late in the winter at a strength of 1 in 20, will kill the aphis, and it is claimed that this spray does not injure the parasite. All spraying should be at high pressure, with the nozzle held close to the colonies so that the woolly covering will be blown away and to enable the spray material to cover the aphis.

### *Budding Stone Fruit*

During this month, the reworking of stone fruit by budding may be commenced. This method of both changing the variety and propagating trees is the most suitable for stone fruit. Rootstocks should be budded within a few inches of ground level. In changing the variety of a tree the buds should be inserted in healthy current season's laterals, at a distance of 6 to 8 inches from their base. A suggestion here may be worthy of adoption by home gardeners. Instead of growing a tree of single variety of peach or plum, &c., several varieties may be budded on the one tree. The earlier

in the life of the tree that this is done, the smaller will be number of buds required. Most home orchardists find that it is difficult to handle all the fruit from a single peach or plum tree. However, a peach tree which has been budded in its early youth to such varieties as Brigg's Red May, Anzac, Zerbes, Smith's and Catherine Anne, would provide a succession of ripe fruit from mid-December until February. Other suitable varieties may be used. The budding of at least two varieties of plums on the one tree will facilitate cross pollination. Suitable combinations would include Early Orleans, Angelina and King Billy, or Grand Duke, President and Jefferson.

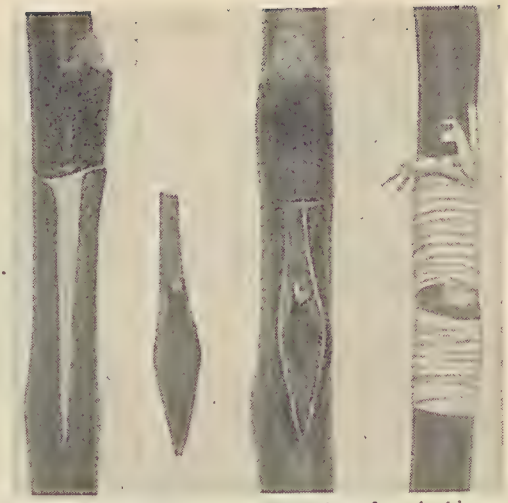
It is important to select healthy, well-grown budwood free from any leaf variegation. It is necessary that the budwood should contain leaf buds. Multiple buds, i.e., a cluster of one or two blossom buds and a growth bud, occur in peaches, apricots, or Japanese plums. These would be suitable, but single blossom buds such as occur in peaches should not be used. Blossom buds are plump and roundish compared with the flatter, pointed leaf buds.

The accompanying illustration indicates the method of preparing the bud and inserting it in the stock.

More detailed information on this subject is contained in the bulletin, "Budding and Grafting Fruit Trees." This publication may be obtained from the Department of Agriculture, Melbourne, at a cost of 1s., post free.

### *Fruit Shedding*

During the early part of the summer, shedding of young immature fruits on deciduous and citrus trees is a normal feature. Some growers may be alarmed when the extent of this dropping is increased. The amount of fruit which drops varies considerably with the variety. The pear variety Packham's Triumph sheds a considerable quantity of small fruit, but rarely is the marketable crop seriously affected.



Stages in the budding operation for deciduous trees. From left to right, "T" cut on stock, flaps of bark raised; the bud; the bud inserted; tying completed.

The variety, Winter Cole, however, retains so much fruit that extensive hand thinning is required so that the fruit will come up to reasonable size. The same variation occurs in other kinds of fruit, such as peaches, plums, and apples.

If shedding is severe, there are several probable causes. These may include a shortage of soil moisture, which affects the fruit crop first, or it may be a lack of nitrogen. These causes may be overcome by adequate watering and manuring. Extensive shedding in fruit varieties such as plums, pears, and apples may also be indicative of inadequate cross pollination. The importance of cross pollination in apples has again been demonstrated this year. It is noticeable that fair crops are being carried where trees of different variety, but blossoming at the same time, are grown in close proximity to each other. In established plantations, grafts of pollenizing varieties should be inserted in the trees where cross pollination is not already provided.

## BOOK REVIEW

*The Young Farmer Annual* 1944, *edited by H. C. F. Morant.* ("*The Young Farmer*", *Collins House*, 360 *Collins-street, Melbourne; 72 pages:* 3*s.* 6*d., postage* 2½*d. extra.*)

Commencing with a message to young farmers written by His Excellency the Governor of Victoria, Sir Winston Dugan, the Annual contains a comprehensive range of instructive and well-illustrated articles written by well-known authorities. Subjects range from nature study to poultry keeping; the breeding of cattle to soil erosion. The principal breeds of livestock are described and illustrated (some in colour).

Altogether the Annual is a creditable publication, well-printed and illustrated, providing an abundance of information on subjects of interest to the primary producer.—A.C.T.H.

# The Flower Garden

By J. L. PROVAN, B.Agr.Sc.,
Principal, School of Horticulture,
Burnley Gardens

PLANNING for winter flowers should begin now. If sowing is delayed until later in the summer or early autumn, winter-flowering plants will not be well established before the cold weather arrives, and flowering will be delayed in consequence.

Raising of seedlings in January and February is not easy but, provided certain precautions are taken, the home gardener can expect very fair results. The first essential in raising seedlings is to obtain good seed of the desired variety. One must make a good beginning, otherwise much of the future work will be wasted. Not only should the seed be viable, that is, give a good germination, but it must be a good strain of the particular variety of plant to be grown.

### *Calendula*

Calendula is the broad-leaved or English pot marigold, and gained its popularity from its rich, intense gold and yellow colours, which are very conspicuous in the winter when the garden is otherwise lacking in colour. Sowings of this plant can be made towards the end of January and during February. It grows well in any good garden loam, particularly if some old rotted manure has been previously dug into the soil. Sow the seed in seed boxes and cover with about ¼-inch of fine sandy soil. Place in a well-lighted, though shady position, and water regularly until the seed germinates.

There are two main types of calendula. One, the soft, loose-petalled type (Chrysantha) has long slender petals and a good length of stem. This strain is more resistant to rust than the flat and straighter petalled types. Good varieties are *Goldmine,* which is a mixture containing both buttercup and clear orange-coloured flowers. It grows to a height of about 15 to 18 inches. *Golden Delight* is a rich buttercup shade, and *Orange Sunshine,* as its name suggests, is an attractive orange colour.

The other type is flat and straight petalled, in which art shades have been developed. The variety *Art Shades* has some attractive pastel colouring. In the older colourings are *Camp Fire Improved,* a deep orange; *Lemon King,* a rich lemon; and *Orange King,* a double-flowered orange shade.

### *Iceland Poppies*

Sow seed of Iceland poppies in seed boxes or sheltered seed beds during January to ensure that plants shall be sufficiently well grown to flower in the winter. The very fine seed should be mixed with the surface soil and kept damp by spreading a sheet of paper over the surface or by shading with paper or hessian. Very light sprinklings of water are necessary to keep the seed moist. The shading is essential while the small seedlings are growing. Do not sow the seed too thickly; mix fine sand with it, using about four to six times as much as the volume of seed. This will assist in thin sowing.

Some of the most popular strains are *Gartford Giant*—art shades, *Gartford Giant*—daffodil tones, *Monstrosa Exhibition. Coonara Pinks* and *Westella Pink Improved* are two good pink strains.

### *Viola*

The viola is a useful subject for massed bedding effects or for planting at the front edge of a flower border. Seed can be sown this month in seed beds or seed boxes, taking the same precautions as for Iceland poppies.

For mixed effects, *Spring Glory* gives excellent results, *Blue Perfection* is a good blue and *Lutea splendens* an attractive yellow. A good lavender blue is *Papilio*. *Apricot* is apricot yellow tinged with orange. *Purple King* a rich deep purple, and *White Perfection* a pure white.

### *Cinerarias and Primulas*

Seed of both these plants should be sown in shady places towards the end of the month, and the soil kept moist. The large giant-flowered cinerarias are popular and make an excellent subject for early spring flowers in sheltered places. *Primula malacoides* is a hardy plant and does well in cool, sheltered situations. The soil should be rich, however, to produce good flower stems. The primula *Brilliancy* is an outstanding variety. The flowers are a vivid crimson with a purplish tinge. *Princess Mary* has rosy lilac flowers. *True Rose* is a good rose colour, and *Dawkin's Pink* is a deep pink.

# The Vegetable Garden

### *General Hints on Watering*

Lettuces which have commenced to heart should not be watered from overhead. If water penetrates into the heart a slimy condition often occurs and the lettuce will become unfit for human consumption. On the other hand, it is good practice to sprinkle the leaves of French beans and red beet, &c., frequently, to discourage the red spider which inhabits the under-surface of the leaves during the hot weather. The same applies to climbing beans.

As a general rule, with the exception of lettuces which are hearting, the best results are obtained in the vegetable garden by thorough overhead sprinklings. It is a good practice to give these thorough soakings at regular intervals in the dry weather and to make sure that the ground is soaked by digging a hole in various parts of the garden.

Some gardeners carefully refrain from watering tomato plants overhead on the assumption that they can thereby reduce the amount of virus disease. There appears to be some justification for this practice during the late spring or early summer, but after the warm weather arrives virus troubles generally decrease, and if the plants are growing strongly few should become infected.

Watering the garden in the early morning appears to give better results than watering in the evening, but of course watering in the morning is often inconvenient in the suburban garden.

### *Sweet Corn*

Sweet corn seed should be sown early this month, otherwise it will not have an opportunity of thoroughly maturing before the cold weather in the autumn stops it growing. Sweet corn requires very warm weather to mature its cobs, and during its growth it needs generous watering and plenty of sunshine. It is a

rapid growing crop and plenty of decayed organic matter or well-rotted manure should be dug into the soil prior to planting.

Plant seeds in rows about 1 inch deep with about 1 foot between each seed, and when the plants commence to grow draw the soil up to the base of the stem. This encourages better development of its shallow root system. Do not cultivate deeply because sweet corn enjoys feeding in the surface soil.

The cobs are ready to pick when the seed is in the milky stage. If allowed to mature beyond this stage, when cooked, they will be tough to eat.

### *Seeds for Sowing*

Dwarf French beans, sweet corn, silver beet; *East Ham* and *Savoy* varieties of cabbage; *Phenomenal Maincrop* cauliflower, *White Stone* turnip; *Chantenay, Danver's Half-Long* carrot; *Detroit Dark Red* and *Crimson Globe* red beet, and *Champion Purple Top* swede.

# BUTTER FACTORY OVERRUN IN VICTORIA

By D. A. LANCASTER, A.F.I.A., L.A.A.,
Inspecting Officer

OVERRUN can be defined as the amount of commercial butter made in excess of the quantity of butterfat received. In actual butter-factory practice it is the difference between the amount of butterfat purchased and paid for, and the amount of butter sold. This is what is referred to on the account sales rendered to suppliers, the overrun being expressed as a percentage, the calculation of which will be referred to under the heading, "Calculation of Overrun."

### *Maximum Overrun*

The maximum overrun allowed in Victoria under the Dairy Produce Regulations is 22 per cent., calculated on the actual weight of butter manufactured, with a reduction of 1.5 per cent. in respect of the proportion of unsalted butter made each month. The quantity of unsalted butter must be recorded by the owner.

The butterfat in any milk or cream, used for purposes other than butter making must be estimated by weighing and testing, and the amount deducted from the total weight of butterfat received. In the case of factories receiving milk, the loss in separating is taken into consideration and allowed for in estimating the overrun.

### *Calculation of Overrun*

The actual butter-factory overrun is calculated by deducting the total weight of butterfat paid for from the total weight of butter made. The per cent. overrun is calculated by multiplying the pounds overrun by 100 and dividing by the pounds of fat received.

Butter — fat = lb. overrun.

Lb. overrun × 100 ÷ fat = per cent. overrun.

From this we evolve the following simple formula to find per cent. overrun.

$$\frac{b - f}{f} \times 100 = \text{per cent. overrun}$$

$b$ and $f$ designating butter and butterfat respectively; e.g., 1,000 lb. of butterfat produces 1,220 lb. of butter, what is the percentage of overrun?

$$\frac{1{,}220 - 1{,}000}{1{,}000} \times 100 = 22 \text{ per cent. overrun.}$$

### *Calculation of Overrun for Unsalted Butter*

The maximum overrun allowed is 22 per cent. for a salted butter, and 20.5 per cent. for an unsalted butter. The percentage of overrun can be calculated by applying the above formula, but a difficulty arises when the total manufacture consists partly of salted and partly unsalted butter. The question then arises—what is the maximum overrun allowed? A moment's reflection will reveal that it is not 22 per cent. or 20.5 per cent., but some percentage lying between these two limits. How is this percentage to be ascertained? The first step is to ascertain the proportion of unsalted butter to the total manufacture, then that fraction of 1.5 per cent. is calculated; the resulting percentage is then deducted from 22 per cent., and the remainder will represent the maximum overrun allowed, e.g., a factory manufactured 20,000 lb. of butter, 5,000 lb. of which was unsalted. What would be the maximum overrun allowed by the Regulations?

$$22 - \left(\frac{5{,}000}{20{,}000} \text{ of } 1{\cdot}5\right) = 21{\cdot}625 \text{ per cent.}$$

Maximum overrun allowed = 21·625 per cent.

### *Calculation to Include Loss in Skimming*

In the case of factories receiving milk, it is necessary to take into consideration the loss of fat in separating and to allow for this loss when calculating the overrun. This loss of fat has been fixed by regulation, for the purpose of calculating overrun, at 0.07 per cent. The pounds of fat lost in the skim milk must be deducted from the quantity of fat contained in the whole milk purchased from suppliers. The resulting amount of butterfat (which will be less than the amount paid for)

will be the figure from which the calculation of permissible manufacture will be made, e.g., a factory receives and separates the following quantity of milk:—

100,000 lb. of 4 per cent. milk.
36 per cent. cream is separated.
Skim milk tests 0.07 per cent. fat.

(*a*) What amount of fat is lost?

(*b*) What amount of fat is left for manufacturing into butter?

(*c*) What is the permissible manufacture?

(*d*) What is the permissible overrun?

Butterfat contained in milk =

$$\frac{100{,}000 \times 4}{100} = 4{,}000 \text{ lb. fat.}$$

Lb. of skim milk =

$$\frac{100{,}000 \times (36-4)}{(36-0{\cdot}07)} = 89{,}062 \text{ lb. skim milk (approx.)}$$

Fat lost in skim milk =

$$\frac{89{,}062 \times 0{\cdot}07}{100} = 62{\cdot}3 \text{ lb. fat.}$$

Fat for butter making =

$4{,}000 - 62{\cdot}3 = 3{,}938$ lb. fat (approx.)

Permissible manufacture =

$$\frac{3{,}938 \times 122}{100} = 4{,}804{\cdot}4 \text{ lb. butter.}$$

Lb. of overrun =

$4{,}804{\cdot}4 - 4{,}000 = 804{\cdot}4$ lb. butter.

Permissible overrun =

$$\frac{804{\cdot}4 \times 100}{4{,}000} = 20{\cdot}1 \text{ per cent.}$$

## *Calculation of Overrun from Farm and Factory Cream*

A further aspect must now be considered—a factory may receive a portion of its supply ex milk, and the balance ex cream. A moment's reflection will reveal that the overrun allowed must be a percentage less than 22 per cent., but higher than the percentage of overrun allowed when the total fat for butter making is derived exclusively from factory separated cream. Taking the foregoing figures we now suppose that in addition 1,062 lb. of fat were received ex supplier cream. The position would now be as follows:—

| | |
|---|---|
| Fat ex milk ... | ... 3,938 lb. |
| Fat ex supplier cream | ... 1,062 lb. |
| Fat for butter making | ... 5,000 lb. |
| Skimming loss ... | .. 62 lb. |
| Total fat purchased | ... 5,062 lb. |

The question now arises—what will be the maximum overrun allowed by the Regulations?

A reduction of 1.9 per cent. overrun must be allowed in respect of butter manufactured from cream separated at the factory, and containing 3,938 lb. butterfat. The proportion of fat ex milk to the total butterfat must first be ascertained and then that fraction of 1.9 per cent. must be found and deducted from 22 per cent. The remainder then equals the maximum percentage of overrun allowed.

$$22 - \left(\frac{3{,}938}{5{,}062} \text{ of } 1{\cdot}9\right) = 20{\cdot}5.$$

Maximum overrun allowed = 20·5 per cent.

Under commercial conditions the above form of calculation is unsuitable, the following formula is therefore recommended for use by operatives working under actual factory conditions. Actually, in such cases, per cent. overrun has little significance, it is the permissible manufacture which is of paramount importance.

| | |
|---|---|
| Butterfat purchased ex milk ... | 4,000 lb. |
| Butterfat ex supplier cream ... | 1,062 lb. |
| Butterfat purchased for butter making ... ... ... | 5,062 lb. |
| Deduct skimming loss .. | 62 lb. |
| Butterfat available for butter making ... ... ... | 5,000 lb. |
| Permissible manufacture ... | 6,100 lb. |

$$\frac{5{,}000}{1} \times \frac{122}{100} = 6{,}100 \text{ lb.}$$

Permissible lbs. overrun ... 1,038 lb.
Permissible per cent. overrun 20.5 per cent.

$$\frac{(6{,}100 - 5{,}062) \times 100}{5{,}062} = 20{\cdot}5 \text{ per cent.}$$

### *Calculation of Overrun when Salted and Unsalted Butters are Manufactured*

It has already been explained that the maximum overrun allowed for an unsalted butter is 20.5 per cent. This fact further complicates the position if our hypothetical factory decides to manufacture both salted and unsalted butters. It is clear that the maximum overrun will be still further reduced depending, of course, on the percentage of unsalted butter manufactured. Taking the foregoing figures we now assume the position to be as follows:—

| | |
|---|---|
| Butterfat ex milk ... ... | 3,938 lb. |
| Butterfat ex supplier cream ... | 1,062 lb. |
| Butterfat available for butter making ... ... ... | 5,000 lb. |
| Add skimming loss ... ... | 62 lb. |
| Butterfat purchased for butter making ... ... ... | 5,062 lb. |

Assuming the manager instructs the butter maker to make 1 ton (2,240 lb.) of unsalted butter and the balance salted. The question now arises—what will be the maximum overrun allowed by the Regulations?

It has been explained that a reduction of 1.9 per cent. overrun must be allowed in respect of butter manufactured from cream ex milk, which contained 3,398 lb. butterfat. This gave, as has already been demonstrated, a maximum allowable overrun of 20.5 per cent. But we must now go a step further and take cognizance of the fact that a portion of the butter manufactured (2,240 lb.) is unsalted, and that the overrun will be further reduced by 1.5 per cent. in respect of that portion. A moment's consideration will reveal the fact, that if all butter were salted the maximum overrun would be 19 per cent. (20.5—1.5). Therefore, the maximum must be some percentage less than 20.5, but greater than 19 per cent. The fat for butter making, in respect of the unsalted butter manufactured, and for which the permissible overrun is 19 per cent., must first be ascertained. The second step will be to calculate the percentage of the total fat available for butter making that has been diverted to the manufacture of unsalted butter. This percentage of 1.5 is then deducted from 20.5 per cent—the remainder will then represent the permissible overrun.

Fat for butter making (unsalted) =

$$\frac{2{,}240}{1} \times \frac{100}{119} = 1{,}882 \text{ lb. fat (approx.).}$$

Permissible overrun =

$$20{\cdot}5 - \left(\frac{1{,}882}{5{,}062} \text{ of } 1{\cdot}5\right) = 19{\cdot}94 \text{ per cent.}$$

When working overruns, under actual factory conditions, the calculation of the amount of skim-milk is simplified (in Victoria) by taking 88 per cent. of the total milk purchased from suppliers to represent skim-milk. Taking the 100,000 lb. of milk supplied to our hypothetical factory, and applying this rule, 88,000 lb. would represent skim-milk. The skimming loss would thus be 61.6 lb. of fat, or 0.7 lb. less than by the method adopted above. This example demonstrates that the difference between the two methods is very slight, and justifies the adoption of the simplified method of calculation.

To make the matter clear we will take a practical problem. A factory receives the following amounts of milk and cream:—

| | |
|---|---|
| 100,000 lb. of milk containing ... ... ... | 4,000 lb. fat |
| 2,655 lb. of cream containing ... ... ... | 1,062 lb. fat |
| Amount of fat paid for ... | 5,062 lb. fat |

The total manufacture is 6,500 lb. of butter, 2,240 lb. of which is unsalted. What is the permissible manufacture?

Lb. of skim milk =

88 per cent. of 100,000 = 88,000 lb.

Fat lost in skim milk =

$$\frac{88{,}000 \times 0{\cdot}07}{100} = 61{\cdot}6 \text{ lb. fat.}$$

Fat for butter making = 5,062 — 61·6 = 5,000 lb. (approx.)

Permissible manufacture (if salted) =

$$\frac{5{,}000 \times 122}{100} = 6{,}100 \text{ lb. butter.}$$

Pounds of overrun =

6,100 — 5,062 = 1,038 lb. butter.

Permissible overrun (if salted) =

$$1{,}038 \times 100 \div 5{,}062 = 20{\cdot}5 \text{ per cent.}$$

Percentage overrun for unsalted portion =

$$20{\cdot}5 - 1{\cdot}5 = 19 \text{ per cent.}$$

Fat for butter making (unsalted) =

$$\frac{2{,}240}{1} \times \frac{100}{119} = 1{,}882 \text{ lb. fat (approx.).}$$

Final permissible overrun =

$$20{\cdot}5 - \left(\frac{1{,}882}{5{,}062} \text{ of } 1{\cdot}5\right) = 19{\cdot}94 \text{ per cent.}$$

Permissible manufacture =

$$\frac{5{,}062 \times 119{\cdot}94}{100} = 6{,}071 \text{ lb. (approx.).}$$

Excess overrun =

$$6{,}500 - 6{,}071 = 429 \text{ lb. butter.}$$

### *Effect of Cream Sales on Overrun*

When portion of the intake of a factory receiving and separating milk, is sold as cream, and the balance used for butter making it is sometimes contended that it is quite unnecessary to apportion the skimming loss between cream sales and butter manufacture. If the skimming loss is not apportioned it will not affect the permissible manufacture—this will be the same in either case—but it will affect the per cent. overrun and the financial result of the transactions. To arrive at the true net profit of the various departments of a factory, it is essential that an apportionment of the skimming loss be made. Only by making such an apportionment can each section be charged with the correct amount of butterfat purchased for purposes of processing, and thus enable the true net profit for each department to be ascertained for costing purposes. For example, taking the following figures, the first method illustrated would result in the butter manufacture being debited with 14,849 lb. of butterfat, and the cream sales department 26,081 lb. of butterfat. When an apportionment of the total skimming loss is made, as in the second example, the butter manufacture department is debited with 14,526 lb. of butterfat, and the cream sales department with 26,404 lb. of butterfat. It is quite clear, therefore, that if this apportionment is not made, as is sometimes the case, cream sales will show a fictitious profit.

EXAMPLE No. 1 (SKIMMING LOSS NOT APPORTIONED).

| | lb. | lb. |
|---|---|---|
| Total butterfat purchased ex milk ... ... ... | | 40,930 |
| Deduct cream sales: — | | |
| Creamery A ... | 7,191 | |
| B ... | 4,519 | |
| C ... | 7,978 | |
| D ... | 3,362 | |
| E ... | 3,509 | |
| | 26,559 | |
| Less cream returns:— | | |
| Creamery A ... | 34 | |
| B ... | 444 | 478 |
| Net cream sales ... ... | | 26,081 |
| | | 14,849 |
| Add cream b/f ... ... | | 106 |
| | | 14,955 |
| Deduct cream c/f ... ... | | 225 |
| | | 14,730 |
| Add farm-separated cream ... | | 8,259 |
| *Net butterfat purchased for butter making* ... ... ... | | 22,989 |
| Deduct skimming loss ... | | 500 |
| *Butterfat available for buttermaking* | | 22,489 |
| Butter manufactured ... | | 27,162 |
| Pounds of overrun ... | | 4,173 |
| Per cent. overrun ... ... | | 18.11 |

$$\frac{(27{,}162 - 22{,}989) \times 100}{22{,}989} = 18{\cdot}11.$$

Permissible manufacture = 27,436·6 lb. butter.

$$\frac{22{,}489}{1} \times \frac{122}{100} = 27{,}436{\cdot}6 \text{ lb.}$$

Permissible percentage overrun = 19·3.

$$\frac{(27{,}436{\cdot}6 - 22{,}989) \times 100}{22{,}989} = 19{\cdot}3.$$

NOTE.—Skimming loss not being apportioned, per cent. overrun is incorrect. However, the above form of calculation is useful as a simple method of arriving at the permissible manufacture for purposes of overrun control under manufacturing conditions.

EXAMPLE No. 2 (SKIMMING LOSS APPORTIONED).

| | lb. | lb. |
|---|---|---|
| Total butterfat purchased ex milk | | 40,930 |
| Deduct cream sales:— | | |
| Creamery A | 7,191 | |
| B | 4,519 | |
| C | 7,978 | |
| D | 3,362 | |
| E | 3,509 | |
| | 26,559 | |
| Less cream returns:— | | |
| Creamery A 34 | | |
| B 444 | 478 | |
| Net cream sales | 26,081 | |
| Plus share of skimming loss | 323 | 26,404 |
| *Butterfat ex milk purchased for butter making* | | 14,526 |
| Add cream b/f | 106 | |
| | 14,632 | |
| Deduct cream c/f | 225 | |
| | 14,407 | |
| Add Farm separated cream | 8,259 | |
| *Net butterfat purchased for butter making* (O.R.) | | 22,666 |
| Less net skimming loss | 177 | |
| *Butterfat available for buttermaking* | | 22,489 |
| Butter manufactured | 27,162 | |
| Pounds of overrun | 4,496 | |
| Per cent. overrun | 19.8 | |

Permissible manufacture = 27,436·6 lb. butter.

$$\frac{22,489}{1} \times \frac{122}{100} = 27,436{\cdot}6 \text{ lb.}$$

Permissible lb. overrun = 4,770·6.

Permissible percentage overrun = 21·05.

$$\frac{(27,436{\cdot}6 - 22,666) \times 100}{22,666} = 21{\cdot}05.$$

*Apportionment of skimming loss:—*

| | lb. | lb. fat |
|---|---|---|
| Intake ex milk | | 40,930 |
| Disposals— | | |
| Sold ex cream | 26,081 | |
| Used for butter | 14,349 | |
| | 40,430 | |
| Lost in skimming | 500 | 40,930 |

Apportionment of skimming loss:—

Borne by butter manufacture—

$$\frac{14,349}{40,430} \times \frac{500}{1} = 177$$

Borne by cream sales—

$$\frac{26,081}{40,430} \times \frac{500}{1} = 323$$

| | lb. | lb. fat |
|---|---|---|
| Total skimming loss | | 500 |
| Butter manufacturing department debited with | 14,349 | |
| | 177 | 14,526 |
| Cream sales department debited with | 26,081 | |
| | 323 | 26,404 |
| *Total intake ex milk* | | 40,930 |

The necessity for apportionment of the skimming loss, as stated earlier, is often disregarded, the contention being that the permissible manufacture will be the same in either case. It is true that, when dealing with the question of overrun as affecting factories receiving and separating whole milk, it is necessary to think in terms of permissible manufacture rather than in terms of per cent. overrun. But immediately cream sales take place another factor arises and apportionment becomes necessary. To illustrate the necessity for apportionment the following example is given. It will be noticed that an extreme case is taken for purposes of illustration, because the result so convincingly demonstrates the necessity for apportionment of the skimming loss.

EXAMPLE No. 3A (SKIMMING LOSS NOT APPORTIONED):

| | lb. |
|---|---|
| Total butterfat purchased ex milk ... | 40,000 |
| Deduct cream sales ... ... | 39,000 |
| *Butterfat purchased for butter making* ... ... ... | 1,000 |
| Deduct skimming loss ... | 500 |
| *Butterfat available for butter making* | 500 |
| Butter manufactured ... | 610 |
| Pounds overrun ... ... | −390 |
| Per cent. overrun ... ... | Nil |

EXAMPLE No. 3B (SKIMMING LOSS APPORTIONED).

| | lb. | lb. |
|---|---|---|
| Total butterfat purchased ex milk ... | | 40,000 |
| Disposals— | | |
| Sold ex cream ... | 39,000 | |
| Used for butter ... | 500 | |
| | 39,500 | |
| Lost in Skimming ... | 500 | 40,000 |

Skimming loss apportioned:—

Borne by butter manufacture—

$$\frac{500}{39{,}500} \times \frac{500}{1} = 7$$

Borne by cream sales—

$$\frac{39{,}000}{39{,}500} \times \frac{500}{1} = 493$$

500

| | lb. |
|---|---|
| Total butterfat purchased ex milk ... | 40,000 |
| Deduct— | |
| Cream sales ... 39,000 | |
| Add share of skimming loss ... ... 493 | 39,493 |
| *Butterfat purchased for butter making* (O.R.) ... ... ... | 507 |
| Less net skimming loss ... | 7 |
| *Butterfat available for butter making* | 500 |
| Butter manufactured ... | 610 |
| Pounds overrun ... ... | 103 |
| Per cent. overrun ... ... | 20.3 |

## *Disposal of Excess Overrun*

The Dairy Produce Act lays down certain conditions relating to the disposal of excess overrun. These conditions may be summarized as follows:—

(1) Within thirty days after the last day of such period during which the prescribed maximum overrun is exceeded, the value of the excess overrun must be distributed *pro rata* amongst the suppliers concerned.

(2) When the excess overrun is less than one half per centum the value of the excess shall be paid quarterly to the credit of the Pure Bred Bull Fund in the control of the Department of Agriculture.

## *Information to be Furnished to Suppliers*

(*a*) The owner of a factory is required by the Dairy Produce Act, on or before the fifteenth day of each month, to conspicuously display in the factory, for a period of fourteen days, a statement showing:—

(1) The total number of pounds of butterfat received for buttermaking at such factory,

(2) the number of pounds of commercial butter manufactured from such butterfat,

(3) the percentage of overrun in respect of such manufacture during the preceding month.

(*b*) The owner of a factory must cause the percentage of overrun in respect of such manufacture during such month to be shown on the first account sales, which are rendered to every supplier to the factory, after the display of the above statement.

## *Composition of Butter*

Regulation 37, Health Acts Regulations, Victoria, prescribes certain limits to which the composition of butter must conform. Thus it would be legal to manufacture a butter for local sale containing 80 per cent. fat, 16 per cent. moisture, and 4 per cent. salt. Such a butter would contain the minimum fat, and the maximum salt and moisture. In addition butter will usually contain about 0.8 to 0.9 per cent. curd. This leads to the consideration of the theoretical overrun which could be attained if all losses and gains, during the process of manufacture, were eliminated, and if exactly 80 per cent. of fat were incorporated in the butter. Under such conditions 80 lb. of butterfat would make 100 lb. of butter, and the overrun would be 25 per cent.

$$\frac{(100 - 80) \times 100}{80} = 25 \text{ per cent.}$$

Unfortunately losses in manufacture are unavoidable, and a butter with such a high salt content would be unsaleable. It is therefore impossible to attain this theoretical overrun of 25 per cent. if all butterfat received is paid for. Correct composition, and the reduction of losses during the process of manufacture to a minimum, is of paramount importance, by this means only can the maximum overrun be legitimately attained. Supposing a butter of the following composition is manufactured:—

| | |
|---|---|
| Fat ... ... | 82.0 per cent. |
| Moisture ... | 15.8 per cent. |
| Salt ... ... | 1.3 per cent. |
| Curd ... ... | 0.9 per cent. |
| | 100.0 per cent. |

If all losses and gains were eliminated the overrun would be 21.95 per cent.

$$\frac{(100 - 82) \times 100}{82} = 21{\cdot}95 \text{ per cent.}$$

If, however, the buttermaker does not strive to attain the maximum yield, and through lack of attention to composition, manufactures a butter containing a high percentage of fat, the effect on the factory overrun will be disastrous. The manufacture of a butter containing 83 per cent. fat (eliminating all losses and gains) will result in an overrun of only 20.48 per cent.

$$\frac{(100 - 83) \times 100}{83} = 20{\cdot}48 \text{ per cent.}$$

When an analysis of a factory's butter reveals faulty composition, but at the same time the maximum permissible overrun is being attained, it means that butterfat is being received which is not paid for. This may occur in two ways, under-reading of tests, or short-weighing of cream. To illustrate the effect that the under-reading of tests has on overrun the following table has been compiled. For purposes of illustration calculations have been made on a basis of a 40 per cent. cream.

| Cream. | Actual Test. | Recorded Test. | Fat Delivered. | Fat Paid For. | Butter Made. | Overrun. |
|---|---|---|---|---|---|---|
| lb. | % | % | lb. | lb. | lb. | % |
| 250 | 40 | 40 | 100 | 100·0 | 122 | 22·0 |
| 250 | 40 | 39 | 100 | 97·5 | 122 | 25·1 |

The adoption of a system of control of factory overrun by actual analysis of the butter would disclose the relationship between the book overrun and the actual or composition overrun. This would result in increased efficiency, and the elimination of the inefficient operative. The weakness of the present system, in this State, is that it does not give the efficient manager who strives to obtain the maximum yield any advantage over his less efficient neighbour who does not worry much about butter composition. If both attain the maximum overrun, one will have attained it by attention to butter composition, the other by not paying for all butterfat received. Such a system of control would entail a great deal of work, and might produce unexpected administrative difficulties, because it would be necessary for an analysis to be made of a large number of butter samples each month. It would, however, be a great advantage to the industry. The following table illustrates the loss to a factory, and incidentally the suppliers, when the average butterfat content of the butter is increased by only 0.5 per cent.

| Average Percentage of Fat in Butter. | Percentage of Overrun Assuming no Losses or Gains. | Butterfat Purchased. | Butter Manufactured. |
|---|---|---|---|
| | | tons | lb. |
| A. 82·0 .. | 21·95 | 1,000 | 2,731,680 |
| B. 82·5 .. | 21·21 | 1,000 | 2,715,104 |
| Additional manufacture by A .. | | | 16,576 |

If the average price received for butter throughout the period was 1s. 5d. per pound, factory A would, assuming other things being equal, have received £1,174 2s. 8d. more for butter manufactured from 1,000 tons of butterfat than factory B. This means that factory A would have this additional amount to distribute to its suppliers.

### *Losses and Gains in Manufacture*

Losses and gains during manufacture are very important; this has been amply demonstrated under the heading "Composition of Butter." Therefore, it is necessary to keep a continuous check on losses, and reduce them to the minimum. Conversely, all legitimate gains should be taken advantage of, because, if exploited to the utmost, they tend to offset the inevitable losses incurred during manufacturing operations. The causes of losses and

gains which influence overrun must be understood if they are to be controlled, therefore, it is convenient to summarize them as follows:

Losses:—

(1) Butter fat lost in skimming,
(2) Milk and cream spilled.
(3) Careless rinsing of cans and vats,
(4) Butter wasted,
(5) Butterfat lost in buttermilk,
(6) Two ounces overweight allowed when packing,
(7) Overweight in excess of two ounces when packing,
(8) Losses in printing,
(9) Incorrect weighing, sampling, and testing,
(10) Faulty butter composition. (Low salt and water content.)

Gains:—

(1) Weights of cream recorded to nearest $\frac{1}{2}$ lb. below,
(2) Weights of cans recorded to nearest $\frac{1}{2}$ lb. above,
(3) Cream tests read to nearest $\frac{1}{2}$ per cent. below,
(4) Good butter composition.

To stress the importance of reducing all losses to a minimum, and taking advantage of all legitimate gains the following table has been compiled.

The table should illustrate the necessity for regular analysis of butter, strict attention to composition, and the reduction of manufacturing losses to a minimum. A factory with a high manufacturing loss, and a high percentage of butterfat in the butter manufactured should have a low overrun. If the overrun is equal to the maximum permitted by the Regulations, it means that butterfat is being received which is not paid for.

***References***


Dairy Produce Act, Vic.
Dairy Produce Regulations, Vic., 1932.
Health Act Regulations, Vic.
Hunziker, O. F., *The Butter Industry*, 3rd Edition.
Valentine, Geo. M., *Butter Overrun and Factors affecting it under New Zealand Manufacturing Conditions.*


| Butterfat in Butter. | Theoretical Percentage of Overrun Assuming Percentage Manufacturing Loss of— | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0. | 0·25. | 0·50. | 0·75. | 1·0. | 1·25. | 1·50. | 1·75. | 2·0. |
| % | | | | | | | | | |
| 80·00 .. .. | 25·00 | 24·68 | 24·37 | 24·06 | 23·75 | 23·43 | 23·12 | 22·81 | 22·50 |
| 80·50 .. .. | 24·22 | 23·91 | 23·60 | 23·29 | 22·98 | 22·67 | 22·36 | 22·04 | 21·73 |
| 81·00 .. .. | 23·45 | 23·14 | 22·83 | 22·53 | 22·22 | 21·91 | 21·60 | 21·29 | 20·98 |
| 81·50 .. .. | 22·69 | 22·39 | 22·08 | 21·77 | 21·47 | 21·16 | 20·85 | 20·55 | 20·42 |
| 82·00 .. .. | 21·95 | 21·64 | 21·34 | 21·03 | 20·73 | 20·42 | 20·12 | 19·81 | 19·51 |
| 82·50 .. .. | 21·21 | 20·90 | 20·60 | 20·30 | 20·00 | 19·69 | 19·39 | 19·09 | 18·78 |
| 83·00 .. .. | 20·48 | 20·18 | 19·67 | 19·57 | 19·27 | 18·97 | 18·67 | 18·37 | 18·07 |

# EARWIGS

Earwigs, which have been very prevalent this season, may be controlled with the aid of traps and poison baits. Boxes or flower pots filled with straw or crumpled paper inverted on the ground will catch numbers. The traps should be examined frequently and the earwigs shaken into a pail of water containing a little kerosene.

The following poison bait will also give good results:—Sodium fluoride, 1 oz.; molasses, $\frac{1}{3}$ pint; bran, 1 lb.; water, 1 pint.

The sodium fluoride is dissolved in water, the molasses stirred in and then the bran is added and the whole is thoroughly mixed together. If it is found that the liquid is insufficient to wet the bran, a little more water may be added, but the bait should not be wet or there is danger of its scorching the plants. Broadcast the bait late in the evening over the ground where earwigs are plentiful. In gardens known to be heavily infested, three applications of the bait are advisable, with intervals of ten days.

[Contributed by the Biological Branch.]

# Registered Fertilizers

## Analyses and Unit Values

*Fertilizers Act* 1928 (No. 3680).

UNIT VALUES FOR THE YEAR 1945.

| | £ | s. | d. |
|---|---|---|---|
| Nitrogen, organic, as Blood; Blood and Bone; Blood, Bone, and Flesh; and Bone .. .. | 1 | 0 | 0 |
| „ as Nitrate .. .. .. .. .. .. .. .. .. | 1 | 3 | 2 |
| „ as Ammonia .. .. .. .. .. .. .. .. .. | 0 | 18 | 0 |
| Phosphoric Acid— | | | |
| as Water Soluble in Superphosphate and Mixed and Complete Fertilizers containing Superphosphate | 0 | 6 | 9 |
| as Citrate Soluble in Superphosphate and Complete Fertilizers containing Superphosphate | 0 | 5 | 6 |
| „ „ in other fertilizers .. .. .. .. .. .. .. | 0 | 5 | 0 |
| as Citrate Insoluble— | | | |
| in Superphosphate .. .. .. .. .. .. .. .. .. | 0 | 2 | 0 |
| in other Fertilizers .. .. .. .. .. .. .. .. .. | 0 | 5 | 0 |
| Potash— | | | |
| as Sulphate .. .. .. .. .. .. .. .. .. .. | 0 | 9 | 3 |
| as Chloride .. .. .. .. .. .. .. .. .. .. | 0 | 8 | 0 |

Melbourne, 2nd December, 1944.

W. R. JEWELL, M.Sc., F.I.C.,
Chemist for Agriculture.

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LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1945.

| Description of Fertilizer. | Brand. | Nitrogen. | | | | | | Phosphoric Acid. | | | | Potash as Unspecified. | Price asked per ton.* | Where Obtainable. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | As Nitrate. | As Ammonia. | As Blood. | As Blood and Bone. | As Blood, Bone, and Flesh. | Total. | As Water Soluble. | As Citrate Soluble. | As Citrate Insoluble. | Total. | | | |
| | | % | % | % | % | % | % | % | % | % | % | % | £ s. d. | |
| *Nitrogenous—Readily Available.* Nitrate of Soda | Sickle in diamond | 16·00 | .. | .. | .. | .. | 16·00 | .. | .. | .. | .. | .. | 18 10 0 | Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne |
| „ „ | Pivot .. | 16·00 | .. | .. | .. | .. | 16·00 | .. | .. | .. | .. | .. | 18 10 0 | The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne |
| „ „ | Cresco .. | 16·00 | .. | .. | .. | .. | 15·50 | .. | .. | .. | .. | .. | 18 10 0 | Cresco Fertilizers Ltd., Little Malop-st., Geelong |
| Sulphate of Ammonia .. | M.G. Co. in diamond | .. | 20·59 | .. | .. | .. | 20·59 | .. | .. | .. | .. | .. | 18 10 0 | The Metropolitan Gas Co., 196 Flinders-st., Melbourne |
| „ „ | Pivot .. | .. | 20·60 | .. | .. | .. | 20·60 | .. | .. | .. | .. | .. | 18 10 0 | The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne |
| „ „ | Sickle in diamond | .. | 20·60 | .. | .. | .. | 20·60 | .. | .. | .. | .. | .. | 18 10 0 | Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne |
| „ „ | Cresco .. | .. | 20·60 | .. | .. | .. | 20·60 | .. | .. | .. | .. | .. | 18 10 0 | Cresco Fertilizers Ltd., Geelong |

| Description of Fertilizer. | Brand. | Nitrogen | | | | | | Phosphoric Acid. | | | | Potash as Unspecified. | Price asked per ton.* | | | Where Obtainable. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | As Nitrate. | As Ammonia. | As Blood. | As Blood and Bone. | As Blood, Bone, and Flesh. | Total. | As Water Soluble. | As Citrate Soluble. | As Citrate Insoluble. | Total. | | £ | s. | d. | |
| | | % | % | % | % | % | % | % | % | % | % | % | | | | |
| *Nitrogenous—Moderately Available.* | | | | | | | | | | | | | | | | |
| Dried Blood .. | Fitzroy .. | .. | .. | 13·00 | .. | .. | 13·00 | .. | .. | .. | .. | .. | 13 | 0 | 0 | W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-st., Melbourne |
| " " .. | T.B. & S. in diamond—Brooklyn | .. | .. | 12·00 | .. | .. | 12·00 | .. | .. | .. | .. | .. | 12 | 0 | 0 | Thos. Borthwick and Sons (A/asia) Ltd., 84 William-st., Melbourne |
| " " .. | T.B. & S. in diamond—Portland | .. | .. | 12·00 | .. | .. | 12·00 | .. | .. | .. | .. | .. | 12 | 0 | 0 | Thomas Borthwick and Sons (A/asia) Ltd., 84 William-st., Melbourne |
| " " .. | M.C.C. in diamond | .. | .. | 12·00 | .. | .. | 12·00 | .. | .. | .. | .. | .. | 12 | 0 | 0 | Melbourne City Council, Town Hall, Melbourne |
| " " .. | Champion .. | .. | .. | 13·00 | .. | .. | 13·00 | .. | .. | .. | .. | .. | 13 | 0 | 0 | Sims Cooper (Freezing Works) Pty. Ltd., 31 Queen-st., Melbourne |
| Blood Manure .. | Pentagon .. | .. | .. | 10·50 | .. | .. | 10·50 | .. | .. | .. | .. | .. | 10 | 10 | 0 | Mulgrave By-Products Co., North-road, East Oakleigh |
| " " .. | M.C.C. .. | .. | .. | 8·00 | .. | .. | 8·00 | .. | .. | .. | .. | .. | 8 | 0 | 0 | Melbourne City Council, Town Hall, Melbourne |
| " " .. | Dandy .. | .. | .. | 10·56 | .. | .. | 10·56 | .. | .. | .. | .. | .. | 10 | 10 | 0 | Gippsland Co-operative Bacon Curing Co. Ltd., Dandenong |
| *Slowly Available.* | | | | | | | | | | | | | | | | |
| Castor Meal .. | Alba .. | .. | .. | .. | .. | .. | 5·00 (as castor meal) | .. | .. | 2·25 | 2·25 | ·75 | 4 | 5 | 0 | Lycett Proprietary Ltd., Normanby-rd., Montague |
| Rape Seed Meal | Alba .. | .. | .. | .. | .. | .. | 5·50 (as rape seed meal) | .. | .. | 1·75 | 1·75 | 1·50 | 5 | 5 | 0 | Lycett Proprietary Ltd., Normanby-rd., Montague |
| Flesh, Hoof, and Treated Leather | No. 3 Fertillo | 8·0 As Flesh, Hoof, and Treated Leather. | .. | .. | .. | .. | 8·0 | .. | .. | .. | .. | .. | 8 | 0 | 0 | Glues and By-Products Pty. Ltd., 86 King-st., Melbourne |
| *Phosphatic—Readily Available.* | | | | | | | | | | | | | | | | |
| Superphosphate —18 per cent. | Cresco .. | .. | .. | .. | .. | .. | .. | 14·00 | 2·50 | 1·50 | 18·00 | .. | 5 | 6 | 0 | Cresco Fertilizers Ltd., Geelong |
| " " | Sickle in diamond | .. | .. | .. | .. | .. | .. | 14·00 | 2·50 | 1·50 | 18·00 | .. | 5 | 6 | 0 | Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne |
| " " | Pivot .. | .. | .. | .. | .. | .. | .. | 14·00 | 2·50 | 1·50 | 18·00 | .. | 5 | 6 | 0 | The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne |
| 22 per cent. | Sickle in diamond | .. | .. | .. | .. | .. | .. | 20·50 | ·50 | 1·00 | 22·00 | .. | 6 | 6 | 0 | Commonwealth Fertilizers and Chemicals Ltd., 65 William-st, Melbourne |
| " " | Cresco .. | .. | .. | .. | .. | .. | .. | 20·50 | ·50 | 1·00 | 22·00 | .. | 6 | 6 | 0 | Cresco Fertilizers Ltd., Little Malop-st., Geelong |
| *Moderately Available.* | | | | | | | | | | | | | | | | |
| Basic Super. reverted | Sickle in diamond | .. | .. | .. | .. | .. | .. | .. | 12·10 | 3·20 | 15·30 | .. | 6 | 0 | 0 | Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne |
| " " | Pivot .. | .. | .. | .. | .. | .. | .. | .. | 12·10 | 3·20 | 15·30 | .. | 6 | 1 | 3 | The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne |

LIST OF REGISTERED FERTILIZERS AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1945—*continued.*

| Description of Fertilizer. | Brand. | Nitrogen. | | | | | | Phosphoric Acid. | | | | Potash as Sulphate. | Price asked per ton.* | | | Where Obtainable. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | As Nitrate. | As Ammonia. | As Blood. | As Blood and Bone. | As Blood, Bone, and Flesh. | Total. | As Water Soluble. | As Citrate Soluble. | As Citrate Insoluble. | Total. | | £ | s. | d. | |
| *Potassic—Readily Available.* | | % | % | % | % | % | % | % | % | % | % | % | | | | |
| Sulphate of Potash | Cresco .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 48·50 | 22 | 10 | 0 | Cresco Fertilizers Ltd., Geelong |
| „ „ | Pivot .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 48·50 | 22 | 10 | 0 | The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne |
| „ „ | Sickle in diamond (90%) | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 48·50 | 22 | 10 | 0 | Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne |
| Muriate of Potash | Sickle in diamond (80%) | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 50·00 (as chloride) | 20 | 0 | 0 | „ „ „ |
| „ „ | Cresco .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 50·00 (as chloride) | 20 | 0 | 0 | Cresco Fertilizers Ltd., Geelong |
| „ „ | Pivot .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 50·00 (as chloride) | 20 | 0 | 0 | The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne |
| MIXED FERTILIZERS. *Containing Nitrogen and Phosphoric Acid—Readily Available.* | | | | | | | | | | | | | | | | |
| Super. and Ammonia | Cresco (3 and 1) | .. | 5·00 | .. | .. | .. | 5·00 | 10·50 | 1·80 | 1·20 | 13·50 | .. | 9 | 6 | 9 | Cresco Fertilizers Ltd., Geelong |
| „ „ | Cresco (6 and 1) | .. | 2·90 | .. | .. | .. | 2·90 | 12·00 | 2·10 | 1·30 | 15·40 | .. | 7 | 18 | 0 | „ „ „ |
| „ „ | Pivot II. (3 and 1) | .. | 5·00 | .. | .. | .. | 5·00 | 10·50 | 1·80 | 1·20 | 13·50 | .. | 9 | 6 | 9 | The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne |
| „ „ | Pivot I. (6 and 1) | .. | 2·90 | .. | .. | .. | 2·90 | 12·00 | 2·10 | 1·30 | 15·40 | .. | 7 | 18 | 0 | „ „ „ |
| „ „ | Sickle in diamond (3 and 1) | .. | 5·00 | .. | .. | .. | 5·00 | 10·50 | 1·80 | 1·20 | 13·50 | .. | 9 | 6 | 9 | Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne |
| „ „ | Sickle in diamond (6 and 1) | .. | 2·90 | .. | .. | .. | 2·90 | 12·00 | 2·10 | 1·30 | 15·40 | .. | 7 | 18 | 0 | „ „ „ |
| Nitro. Superphosphate | Sickle in diamond | .. | 1·50 | .. | .. | ·50 | 2·00 | 11·60 | 2·60 | 1·80 | 16·00 | .. | 7 | 15 | 0 | „ „ „ |
| „ „ | Cresco .. | .. | 1·50 | .. | ·50 | .. | 2·00 | 11·60 | 2·60 | 2·40 | 16·60 | .. | 7 | 15 | 0 | Cresco Fertilizers Ltd., Geelong |
| *Moderately Available.* | | | | | | | | | | | | | | | | |
| Blood, Bone, and Super. | Sickle in diamond | .. | .. | .. | .. | 2·50 | 2·50 | 9·30 | 4·10 | 3·40 | 16·80 | .. | 7 | 18 | 6 | Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne |
| Bone and Super. | Sickle in diamond, No. 1 | .. | .. | .. | .. | 2·00 | 2·00 | 8·00 | 4·20 | 5·60 | 17·80 | .. | 7 | 17 | 0 | „ „ „ |
| „ „ | Cresco No. 1 | .. | .. | .. | 2·00 | .. | 2·00 | 8·00 | 4·00 | 6·00 | 18·00 | .. | 7 | 17 | 0 | Cresco Fertilizers Ltd., Geelong |
| Super. and Bone | Cresco No. 2 | .. | .. | .. | .. | 1·00 | 1·00 | 11·80 | 3·10 | 2·30 | 17·20 | .. | 7 | 5 | 9 | „ „ „ |
| „ „ | Sickle in diamond, No. 2 | .. | .. | .. | .. | 1·00 | 1·00 | 11·80 | 3·10 | 2·30 | 17·20 | .. | 7 | 5 | 9 | Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne |
| *Nitrogen—Slowly Available.* | | | | | | | | | | | | | | | | |
| Flesh, Hoof, and Treated Leather with Bone | Fertillo No. 4 | 5·55 (As Flesh, Hoof, and Treated Leather.) | .. | ·20 (as bone) | .. | .. | 5·75 | .. | 4·00 | 6·00 | 10·00 | .. | 8 | 0 | 0 | Glues and By-Products Pty. Ltd., 86 King-st., Melbourne |
| „ „ | Fertillo No. 2 | 5·55 | .. | ·20 (as bone) | .. | .. | 5·75 | 2·00 | 2·00 | 6·00 | 10·00 | .. | 8 | 0 | 0 | „ „ „ |
| „ „ | Pannifex's (G) | 4·75 | .. | 1·50 (as bone) | .. | .. | 6·25 | .. | 7·25 | 6·25 | 13·50 | .. | 9 | 12 | 6 | H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne |

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1945—*continued.*

| Description of Fertilizer. | Brand. | Nitrogen. | | | | | | Phosphoric Acid. | | | | Potash as Unspecified. | Price asked per ton.* | Where Obtainable. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | As Nitrate. | As Ammonia. | As Blood. | As Blood and Bone. | As Blood, Bone, and Flesh. | Total. | As Water Soluble. | As Citrate Soluble. | As Citrate Insoluble. | Total. | | | |
| | | | % | % | % | % | % | % | % | % | % | % | £ s. d. | |
| ANIMAL FERTILIZERS. | | | | | | | | | | | | | | |
| *Containing Nitrogen and Phosphoric Acid—Moderately Available.* | | | | | | | | | | | | | | |
| Blood and Bone | J. A. Dundas' | .. | .. | .. | .. | 4·50 | 4·50 | .. | 7·14 | 13·61 | 20·75 | .. | 9 13 9 | J. A. Dundas, Dynon-rd., Footscray |
| " " | Fitzroy Special | .. | .. | .. | .. | 5·00 | 5·00 | .. | 13·00 | 5·00 | 18·00 | .. | 9 10 0 | W. Anglis and Co. (Aust.) Pty. Ltd., 42 Bourke-st., Melbourne |
| " " | Premier .. | .. | .. | .. | .. | 7·00 | 7·00 | .. | 6·50 | 5·50 | 12·00 | .. | 10 0 0 | " " " |
| " " | Murray .. | .. | .. | .. | 5·25 | .. | 5·25 | .. | 4·50 | 7·50 | 12·00 | .. | 8 5 0 | Western and Murray Co-operative Bacon and Meat Packing Co. Ltd., 522 Flinders-lane, Melbourne |
| " " | Pridham's .. | .. | .. | .. | 5·10 | .. | 5·10 | .. | 6·00 | 8·00 | 14·00 | .. | 8 10 0 | W. Pridham Pty. Ltd., Evans-st., Braybrook |
| " " | Ibis .. | .. | .. | .. | .. | 5·25 | 5·25 | .. | 8·41 | 6·17 | 14·58 | .. | 8 18 0 | Ficken, Halliday, and McClelland Pty. Ltd., 634 Bourke-st., Melbourne |
| " " | P.M. .. | .. | .. | .. | .. | 7·00 | 7·00 | .. | 6·31 | 5·69 | 12·00 | .. | 10 0 0 | J. Kitchen and Sons Pty. Ltd., Ingles-st., Port Melbourne |
| " " | Solo .. | .. | .. | .. | .. | 7·00 | 7·00 | .. | 4·25 | 10·75 | 15·00 | .. | 10 15 0 | " " " |
| " " | Cockatoo .. | .. | .. | .. | .. | 5·18 | 5·18 | .. | 10·97 | 8·00 | 18·97 | .. | 8 10 0 | R. Fordham, Cressy-rd., Camperdown |
| " " | Echuca .. | .. | .. | .. | .. | 4·83 | 4·83 | .. | 8·17 | 7·65 | 15·82 | .. | 8 15 9 | B. A. Thomas, Echuca Freezing Works, Goulburn-rd., Echuca East |
| " " | Champion .. | .. | .. | .. | 7·00 | .. | 7·00 | .. | 3·50 | 4·50 | 8·00 | .. | 9 0 0 | Sims Cooper (Freezing Works) Pty. Ltd., Henty House, 499 Little Collins-st., Melbourne |
| " " | Fitzgerald's | .. | .. | .. | 5·00 | .. | 5·00 | .. | 9·10 | 5·90 | 15·00 | .. | 8 15 0 | P. Fitzgerald and Sons, Oakleigh |
| " " | T.B. and S. in diamond (Portland) | .. | .. | .. | 6·00 | .. | 6·00 | .. | 7·00 | 5·00 | 12·00 | .. | 9 0 0 | Thos. Borthwick and Sons (A/asia) Ltd., 84 William-st., Melbourne |
| " " | T.B. and S. in diamond No. 1 (Brooklyn) | .. | .. | .. | 6·00 | .. | 6·00 | .. | 7·00 | 5·00 | 12·00 | .. | 9 0 0 | " " " |
| " " | T.B. and S. in diamond No. 2 (Brooklyn) | .. | .. | .. | 4·50 | .. | 4·50 | .. | 7·00 | 11·00 | 18·00 | .. | 9 0 0 | " " " |
| " " | Apex .. | .. | .. | .. | .. | 5·00 | 5·00 | .. | 7·00 | 8·00 | 15·00 | .. | 8 15 0 | North-Eastern Bone Products, Wangaratta |
| " " | Pannifex's (C) | .. | .. | .. | .. | 5·00 | 5·00 | .. | 6·00 | 8·00 | 14·00 | .. | 8 10 0 | H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne |
| " " | Valley .. | .. | .. | .. | .. | 6·17 | 6·17 | .. | 4·81 | 2·75 | 7·56 | .. | 8 0 0 | Goulburn Valley Freezing Works, Shepparton |
| " " | M.S.C. .. | .. | .. | .. | 6·25 | .. | 6·25 | .. | 4·50 | 6·25 | 10·75 | .. | 8 18 9 | Mildura Shire Council, Mildura |
| " " | Arch No. 1 | .. | .. | .. | 7·00 | .. | 7·00 | .. | 7·00 | 4·00 | 11·00 | .. | 9 15 0 | Victorian Inland Meat Authority, 54 Market-st., Melbourne |
| " " | B. & H. .. | .. | .. | .. | 7·00 | .. | 7·00 | .. | 3·5 | 3·5 | 7·00 | .. | 8 15 0 | C. H. Bell, Mill-rd., Laverton |
| " " | Corio .. | .. | .. | .. | 4·50 | .. | 4·50 | .. | 6·0 | 8·0 | 14·00 | .. | 8 0 0 | The Corio Trading Co. Pty. Ltd., 164 Moorabool-st., Geelong |
| Animal Fertilizer | A and A Surprise | .. | .. | .. | 5·50 | .. | 5·50 | .. | 4·00 | 10·00 | 14·00 | .. | 9 0 0 | G. W. Pennell, (dec'd), Burke-street, Braybrook |

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1945—*continued.*

| Description of Fertilizer. | Brand. | Nitrogen. | | | | | | Phosphoric Acid. | | | | Potash as Unspecified. | Price asked per ton.* | Where Obtainable. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | As Nitrate. | As Ammonia. | As Blood. | As Blood and Bone. | As Blood, Bone, and Flesh. | Total. | As Water Soluble | As Citrate Soluble. | As Citrate Insoluble. | Total. | | | |
| | | % | % | % | % | % | % | % | % | % | % | % | £ s. d. | |
| COMPLETE FERTILIZERS | | | | | | | | | | | | | | |
| *Containing Nitrogen, Phosphoric Acid, and Potash—Readily Available* | | | | | | | | | | | | | | |
| Complete Fertilizer | Sickle in diamond (Market Garden) No. 2 | .. | 2·90 | .. | .. | ·95 | 3·85 | 8·60 | 3·20 | 2·50 | 14·30 | 2·42 | 9 18 9 | Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne |
| " " | Sickle in diamond (A) (5:1:1) | .. | 2·90 | .. | .. | .. | 2·90 | 10·00 | 1·80 | 1·10 | 12·90 | 6·90 | 10 14 0 | " " " |
| " " | Sickle in diamond (C) (4:4:1) | .. | 9·15 | .. | .. | .. | 9·15 | 6·20 | 1·10 | ·70 | 8·00 | 5·39 | 14 5 6 | " " " |
| " " | Pivot IV. (5:1:1) | .. | 2·90 | .. | .. | .. | 2·90 | 10·00 | 1·80 | 1·10 | 12·90 | 6·90 (as sulphate) | 10 14 0 | The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne |
| " " | Cresco (Market Garden) | .. | 1·70 | .. | 1·50 | .. | 3·20 | 8·20 | 3·20 | 4·20 | 15·60 | 2·42 | 9 18 9 | Cresco Fertilizers Ltd., Geelong |
| " " | Cresco, No. 2 (4:4:1) | .. | 9·15 | .. | .. | .. | 9·15 | 6·20 | 1·10 | ·70 | 8·00 | 5·39 | 14 5 6 | " " " |
| " " | Cresco, No. 3 (5:2:1) | .. | 5·15 | .. | .. | .. | 5·15 | 8·75 | 1·60 | ·90 | 11·25 | 6·06 | 11 17 0 | " " " |

| Bonedust. | Brand. | Nitrogen. | Phosphoric Acid. | Mechanical Condition. | | Price asked per ton.* | Where Obtainable. |
|---|---|---|---|---|---|---|---|
| | | | | Fine Bone. | Coarse Bone. | | |
| | | % | % | % | % | £ s. d. | |
| Bonedust .. | Apex .. | 3·25 | 20·00 | 50·0 | 50·0 | 8 5 0 | North-Eastern Bone Products, Wangaratta |
| " .. | Mount Clear .. | 3·00 | 19·00 | 50·0 | 50·0 | 7 15 0 | Bailey Bros., 6 Sturt-street, Ballarat |
| " .. | Pannifex's .. | 2·50 | 26·00 | 50·0 | 50·0 | 9 0 0 | H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne |
| Degelatinized Bone Flour | Fertillo .. | 1·00 | 32·50 | 95·0 | 5·0 | 9 2 6 | Glues and By-Products Pty. Ltd., 86 King-street, Melbourne |
| Degelatinized Bonedust | T.B. and S. in diamond—Brooklyn | 2·50 | 24·0 | 50·0 | 50·0 | 8 10 0 | Thos. Borthwick and Sons Aust. Ltd., 84 William-street, Melbourne |
| " " | T.B. and S. in diamond—Portland | 2·50 | 24·00 | 50·0 | 50·0 | 8 10 0 | " " " " " " |
| " " | VIMA .. | 4·50 | 20·00 | 55·0 | 45·0 | 9 10 0 | Victorian Inland Meat Authority, 54 Market-street, Melbourne |
| " " | Bendigonian .. | 4·00 | 22·10 | 50·0 | 50·0 | 9 5 6 | Bendigo Fertilizer and Wool Co. Pty. Ltd., Charing Cross, Bendigo |

* F.O.R. at Melbourne or Railway Station nearest place of manufacture.

W. R. JEWELL, M.Sc., F.I.C.,
Chemist for Agriculture.

Melbourne, 2nd December, 1944.

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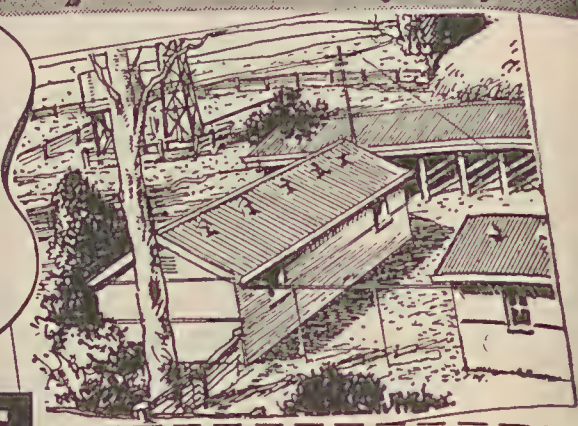

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# THE SHORTAGE OF SEED OATS

## Sow Wheat for Grazing and Hay

By H. J. SIMS, M.Agr.Sc., Manager, Mallee Research Station, Walpeup

Supplies of seed oats, barley, and rye are greatly below requirements, due to drought conditions which have prevailed over the south-eastern portion of Australia for the past two seasons. Wheat is the only cereal seed available to Victorian farmers in sufficient quantities for sowing large areas, and farmers therefore will have to make the maximum use of this cereal. Some comparisons of the yields of wheat and oats for grazing and for hay at the Mallee Research Station are set out in the following article.

UNDER conditions such as are being experienced, and with depleted fodder reserves, the cutting of the maximum possible quantity of hay this year is the aim of most farmers. Much of the country did not set grass seed last year and has now been blown bare, consequently the sowing of some cereal for grazing is essential. Oats have always been the first choice for hay and grazing, but the necessary supplies of seed oats cannot be located. Barley is a popular choice for greenfeed, but again seed for sowing for grazing purposes cannot be obtained. The Barley Board is making arrangements for supplies of seed barley for sowing for grain by licensed growers, therefore their problem is being solved.

Rye also is popular as greenfeed, but again the supply is acutely short and it is felt that the best use of this cereal will be made if the seed available is sown for sand-drift control.

This leaves wheat as the only cereal available for large-scale sowing next year. Arrangements have been made regarding the supply of seed wheat through Government channels, but it is possible that wheat used for hay and grazing will be obtained from the surplus held over from previous years.

It is realized that oats are to be preferred to wheat for hay or for grazing. As a rotation crop it is not susceptible to most wheat diseases, but such factors cannot receive their usual consideration this year.

### *Wheat for Hay*

During past years, comparisons have been made at the Mallee Research Station between various wheat and oat varieties for hay on fallow. These trials have shown that, over a period of test, a tall-growing early-maturing wheat, such as Bencubbin, is capable of giving yields of the same order, or a little better, than the earlier varieties of oats; but that a short-strawed wheat variety, such as Ghurka, gives yields about 20 to 25 per cent. lower than early oats. Rance 4H gave yields intermediate between Bencubbin and Ghurka and slightly below the early oats, but better than the standard variety, Algerian.

The following table gives some of the comparisons available:—

TABLE 1.—CEREAL HAY TRIALS ON FALLOW.

| Variety. | Average 3 years, 1939–41. | Average 2 years, 1940–41. |
|---|---|---|
| | cwt./ac. | cwt./ac. |
| Bencubbin .. .. .. | 38·7 | 32·4 |
| Rance 4H .. .. .. | 35·9 | 27·7 |
| Ghurka .. .. .. | .. | 22·8 |
| Dawn .. .. .. | 36·8 | 29·8 |
| Mulga .. .. .. | 34·9 | 27·6 |
| Algeribee .. .. .. | .. | 28·0 |
| Algerian .. .. .. | .. | 25·6 |
| Shandy (Bencubbin and Mulga) | .. | 30·1 |

The above comparisons refer to yields obtained on fallow, and it is expected that similar percentage differences would be obtained on land which failed to grow a crop last year or on "ley" ground. Therefore, if wheat is sown for hay, and appropriate varieties are used (where obtainable), there should be no serious reduction in yield compared to oats. If Ghurka or similar wheats, predominate in the mixed wheat sown, lower yields may be expected.

Wheaten hay should be cut greener than it is usual to cut oaten hay and, as the grain does not fill properly, stacks are less liable to mouse damage than oaten hay stacks.

### *Wheat for Grazing*

For grazing purposes, it seems that only bagged or bulk wheat will be available this year. Past experience has shown wheat to be inferior to other cereals for grazing. In the period of test, Dawn oats gave approximately 10 per cent. higher grazing yield than Rance 4H wheat. However, if a good year is experienced, such a position should not be serious and certainly much more feed will be obtained from many paddocks, now bare, if wheat is sown for grazing than if they are left to regenerate their own cover.

A five-year comparison of the various cereals for grazing at the Research Station is shown in Table 2:—

TABLE 2.—COMPARISON OF CEREAL VARIETIES FOR GRAZING—AVERAGE 5 YEARS, 1937-41. YIELDS IN CWT./AC. GREENSTUFF—80 PER CENT. MOISTURE.

| Variety. | 1st Grazing Mid-July. | 2nd Grazing Early Sept. | 3rd Grazing Late Oct. | Total All Grazings. |
|---|---|---|---|---|
| Black Winter Ryecorn .. | 10·7 | 11·9 | 13·1 | 35·7 |
| Dawn Oats .. | 9·6 | 9·6 | 10·0 | 29·2 |
| Cape Barley .. | 6·3 | 9·2 | 12·9 | 28·4 |
| Rance 4H Wheat | 6·9 | 8·5 | 11·1 | 26·5 |

In sowing a crop for grazing, the rate of seeding used is a most important factor and, if the seed is available, heavier rates than for grain give higher yields of greenstuff.

### *Sowing for Drift Control*

Many sandy and wind-blown areas will require the cover of some plant growth to stabilize them. Ryecorn is the outstanding cereal for this purpose, but seed will not be available in sufficient quantities to enable this to be sown everywhere that it is desirable, and wheat will have to be used for this purpose also. To obtain the maximum benefit from the limited stocks of rye, the better ground should be sown to wheat, leaving the other areas for ryecorn.

### *Seed Should be Graded*

Wheat obtained from bagged stacks or bulk wheat, may contain weed seeds, chaff, and cracked grain. It is necessary, therefore, that wheat sown for hay or grazing should be graded to ensure even running in the drill and to grade out undesirable weed seeds. It should be possible, with careful management, to grade out practically all weed seeds, although some difficulty may be experienced in eliminating all saffron thistle seeds.

It will be necessary to make arrangements through the Wheat Stabilization Committee for the sowing of extra areas of wheat for the above purposes, but in view of the present seasonal conditions and the shortage of all other cereals for sowing, it is not anticipated that any serious difficulties will be met with in obtaining temporary licences through the Committee.

### *Sow Wheat for Dairy Cows*

The acute shortage of seed oats will prevent many dairymen from sowing their usual area of crop for autumn and winter grazing. While this difficulty cannot be overcome entirely by the use of substitute crops, much can be done by sowing wheat instead of oats when seed oats are not procurable.

Wheat is not as prolific a green crop as oats, nor does it recover from grazing to the same extent. A paddock of wheat, however, will provide some autumn and winter feed when other pasturage is scarce, and will also provide a moderate hay crop at the end of the season.

Wheat for this purpose should be sown early, as oats are, and a heavy seeding rate is advised (100 to 120 lb. per acre). This will offset the effects of grazing to some extent, and will allow the crop to make a better recovery than if a light seeding were used.

The hay crop obtained at the end of the season will be improved if two paddocks are sown. One should be grazed early, and the other later in the winter. It is not advisable to graze the same crop twice if it is to be saved for hay, as the recovery of wheat from a second grazing is generally poor, and the hay crop light.

It is not suggested that wheat is capable of replacing oats as a grazing crop, but when oats are unobtainable it is a good alternative and will provide a quantity of green feed when the normal pastures are lacking, and in this way will assist dairymen to maintain their herds in good condition and at maximum production.

# SHEEP HUSBANDRY AND DISEASE CONTROL

By A. R. GRAYSON, B.V.Sc., Veterinary Officer

Adequate shelter is an essential to good sheep husbandry.

THE sheep industry in all its phases of wool, mutton, and fat lamb production, together with its associated secondary products, is of paramount importance to Australia. Looking back, we realize that in the relatively short time during which Australia has been developing her sheep industry, great progress has been made—in the clearing of bush country, in the establishment, improvement, and management of pastures, in the use of artificial fertilizers, in the selection, improvement, and standardization of sheep breeds as well as in the knowledge of sheep diseases.

The problem which confronts all sheep owners to-day is the way, or ways, in which modern knowledge—particularly in regard to sheep diseases—may be applied towards not only the scientific, but also the economic management of their flocks. It will be the aim, in this article, to indicate how, in the light of our present knowledge, ordinary routine procedure in sheep management may be carried out with a view to disease control.

Practically throughout the whole of Victoria, where rainfall conditions are suitable, or where irrigation can be practised, pasture improvement, associated with the application of superphosphate and the introduction of better grasses and clovers, has come into general use. By this means the land has been rendered more productive, and the volume of seasonal growth has been much increased. This extra growth, together with the conservation of surplus fodder, has considerably increased the carrying capacity of the land. Associated with this increase in the rate of stocking, and perhaps largely in consequence of it, is an increase in the incidence of the various diseases amongst sheep. This fact, in itself, provides sufficient reason for the closer and more painstaking attention to those details of sheep management which tend to lessen the risk of these diseases or to minimize their effects.

One aspect of sheep management which has received considerable prominence of later

years is that relating to the mineral requirements of sheep, and the mineral contents of pastures. Briefly, the mineral elements which are of major importance to animal life—though not necessarily in the order of importance—are calcium, phosphorus, sodium, and chlorine. The importance of these named minerals is perhaps quantitative, as mere traces of other minerals are equally essential to life. The importance of the four named minerals is bound up in the development of the skeletal structure, the maintenance of acidity and alkalinity of body tissues, the proper functioning of cell metabolism and the removal of waste products from the body cells. It is in respect of these two latter functions that the sodium and chlorine elements have their primary importance.

The diet of sheep normally contains sufficient calcium and phosphorus for the maintenance of health, provided the soil has a normal content. This applies practically throughout the whole of Victoria. The application of superphosphate increases the phosphorus content of pastures in the form of protein phosphates and roughage—particularly leguminous roughage—has a fairly high calcium content. It would appear therefore that the provision of licks for sheep containing either di-calcic phosphate or bone meal and other minerals becomes an unnecessary expenditure in the greater area of Victoria. Recent experiments conducted by the Council for Scientific and Industrial Research indicate that the returns obtained do not justify the expense involved. The feeding of molasses is recommended, primarily because of its food value and also because, as will be seen later, it does have a definite value in the preventive control of some disease conditions. When supplies of the solid or block molasses are again available it would be preferable to supply it in this form rather than to mix it with salt. When mixed with salt some sheep, because of their partiality to the molasses, may get an excess of salt.

### *Routine Operations*

In regard to distinctive disease conditions as such, it is well recognized that different diseases are met with during different periods of the year, and amongst different classes of sheep, i.e., lambs, weaners, adult sheep, &c. Similarly at different periods of the year different and regular routine operations are carried out. Can these routine operations be so conducted as to really become methods of prevention of disease?

The first operation conducted during the lifetime of the sheep is that of lamb-marking. The use of temporary yards, erected in the paddocks on which the ewes and lambs are running, the carrying out of the operations in mild weather, and then only in the morning and early afternoon to ensure proper mothering of the lambs, the thorough and frequent sterilization of all instruments and the hands of the operator, the careful handling of the lambs, are all recommended as being likely to lessen mortalities, either as a direct result of the operation, or as the result of after-infection. The preventive inoculation of lambs against entero-toxaemia (pulpy kidney) can be carried out at the same time as lamb-marking.

Entero-toxaemia is the next trouble most likely to affect the young lamb. It is well to bear in mind, however, that while in Victoria most losses from this disease, more commonly known as pulpy kidney, occur amongst young lambs, losses amongst adult sheep are by no means rare. Entero-toxamia is caused by the toxins produced by the rapid multiplication, in the sheep's intestines, of an organism that is a more or less normal inhabitant of that region. It is known also that a condition of bowel stasis, i.e., a sluggishness of the bowels, is a predisposing factor toward the multiplication of the organism and the liberation of the toxin. The main stimulants to peristalsis or bowel movement in sheep are exercise, and fibre or cellulose in the fodder. Knowing these facts, we can then adapt the management of the growing lambs towards preventing the onset of this disease.

The feeding of fibre in the form of chaff or hay as a supplementary ration, even in the flush of the season is recommended, for, even at this flush period, ewes and lambs will partake of dried feed if it is provided. Where meadow hay is the main conserved fodder, the practice of building stacks in the paddocks in which the ewes and lambs will be grazing will make it easier to feed to the sheep. The system of rotational grazing with its consequent frequent movements from paddock to paddock will, in some measure, provide exercise. Failing this, compulsory gentle exercise should be given the flock. The destruction of all carcasses, by burning if possible, is a definite control measure against this as well as other diseases, and this practice should be rigidly adhered to.

### *Internal Parasites*

No animal suffers more severely from internal parasites than does the sheep—particularly the young sheep. This fact is associated with its close grazing habits and with the modern methods of sheep-raising. Even in dry areas sheep are not entirely free from parasites, but where the annual rainfall exceeds 20 inches—or in irrigation areas—worms may become very serious. Moisture is essential for the development of larval worms in pastures, and consequently outbreaks are chiefly dependent on the rainfall. Losses from worms are not to be measured solely by mortalities. Such ill effects as failure to grow and fatten, loss of condition, and decreased wool values must also be taken into consideration.

Our knowledge of the life histories of internal parasites or worms, including liver fluke, shows that there are certain factors which influence the development of the eggs and larvae in the pastures, and factors which affect the resistance of sheep to infection. In the light of this knowledge certain principles of control of parasitism may be laid down. This control does not necessarily aim at the complete eradication of all internal parasites, which, under the normal conditions of sheep-raising, would be practically impossible, but rather at keeping their numbers below the point at which they become harmful. These principles are as follows:—

**Avoid overstocking,** which by its consequent close grazing greatly increases the chances of infestation.

**Avoid Damp and Marshy Pastures.**—Where possible these areas should be drained, or, if this is not possible, they should be fenced off, as should also all dams and watering places. Troughs for watering the stock should be supplied, and they should be cleaned regularly.

**Rotate the Grazing of Pastures.**—Where practicable this is an excellent system of control. The animals are kept moving from pasture to pasture so that they do not remain on any one paddock sufficiently long to grossly contaminate it. Rotation should be continued in the one direction.

**Periodic Firing or Cultivation of Pastures.**—Burning off of worm-infested pasture is one of the best means of destroying larval worms. Where burning-off is not practical, cultivation of the paddock, with its consequent enforced spelling, is equally advantageous.

**Nutrition.**—This is a very important factor in the control of parasitic diseases. It has been shown definitely that sheep on a highly nutritive pasture or ration can withstand much heavier infestations than can sheep on poor pasture. Although this is so, a limit to the carrying capacity is eventually reached, and if exceeded, serious losses may occur. On all pastures, whether improved or natural, the provision of a supplementary ration such as meadow hay, lucerne, oaten chaff, or grain is recommended.

Sheep grazed on highly nutritive feed can withstand heavier infestations of internal parasites than poorly fed sheep.

Although the principles outlined above do form an effective means of control, systematic treatment is, however, the main line of defence.

Methods of treatment for the various parasitic and allied diseases, i.e., black disease, &c., will not be outlined here. Further particulars regarding treatment for these diseases have been published in pamphlet form, and may be obtained post free on application to the Director, Department of Agriculture, Melbourne. C.2. It is essential to remember, however, that where treatment is indicated, it should be applied to every member of the flock, and not confined to those sheep which appear to be infested. Further, it is bad management to wait until the sheep are so badly infested as to appear noticeably ill. By judicious, regular, and systematic treatment the infestations can be kept so low that serious outbreaks do not occur.

### *Foot-rot*

Another disease with a seasonal incidence, and which, in wet years, can assume serious importance is foot-rot. Sheep husbandry can play an equally important part in the control of this disease. While discussing foot-rot, it must be remembered that the term has been loosely applied to all conditions of the feet of sheep which are associated with pus-formation and lameness. Investigations by officers of the Council for Scientific and Industrial Research have proved that although outbreaks of true foot-rot occur only under favourable seasonal conditions, the disease is, nevertheless, specifically contagious, and therefore cannot occur except when the specific causal agent is present. It has also been shown that the causal agent cannot survive longer than a few weeks, at most, on pastures, apart from the sheep, and therefore the removal, during summer, of all sheep carrying the infection should entirely free the flock and the property from this trouble. When the infection has thus been eliminated, the disease will not recur unless introduced from outside sources.

To prevent re-infection it would be necessary to carefully examine, during the late summer, the feet of all sheep on the property, and isolate immediately all animals showing chronic lesions. During this examination all mis-shapen feet should be pared. As an additional safeguard all sheep should be passed through a suitable foot bath. If a large number of sheep is affected it may be necessary to make two examinations, with an interval of about four weeks between them.

Sheep isolated at either examination should be treated and not returned to the flock until a month has elapsed after they have been completely cured, or, in some cases, it may be convenient to kill them or sell them for slaughter. Pasture on which infected sheep had been grazing should be kept free from sheep for a period of preferably three to four weeks before clean sheep are put on it. All introduced sheep should be similarly carefully examined and treated, and kept apart from the main flock for a period of at least three to four weeks after the complete cure of any case. Such control measures, as well as being effective against true foot-rot, will also minimize the incidence of such conditions as scald and digital suppuration (foot abscess).

### *Nutritional Diseases*

There are two disease conditions in pregnant ewes, both of which are nutritional in nature and in both of which the essentials in prevention are closely wrapped up in good breeding ewe husbandry. The first of these is pregnancy toxaemia or, as it is often termed, twin-lamb disease. This is a non-contagious condition which occurs in pregnant ewes shortly before lambing, and ewes carrying twin lambs are more likely to be affected. As already indicated, it is nutritional in nature, and generally occurs in ewes that are falling away in condition, as a result of an inadequate food supply for the needs of the ewe and the rapidly developing lamb or lambs.

In these cases it would appear that the onset of the condition is due to glycogen being withdrawn from the liver to maintain the blood sugar level, and to fat taking its place. At times the condition has been seen in fat ewes that are well fed on rich pastures. In these cases the onset is associated with lack of exercise. In both instances it will be seen that the disease is, at least, partly due to the incorrect feeding and management of the pregnant ewe.

Consequently rational management should be practised throughout the whole of the in-lamb period. The ewes should be kept in good condition by judicious feeding, but not allowed to become over-fat. They certainly should not be allowed to suffer as the result of malnutrition. Allowing the ewes to run on poor pasture and then placing them on very good feed just prior to lambing is an equally bad practice as is the converse. The question of the hand-feeding of in-lamb ewes should receive greater consideration, particularly

Hand-feeding is an important factor in reducing the incidence of nutritional diseases in sheep.

with a view to providing a balanced ration. The ewes should not be confined in a small area of good pasturage, but should be allowed a large enough run for exercise while obtaining their food.

Oats, good oaten chaff, good quality meadow hay or lucerne hay are all suitable supplementary fodders. When hand feeding is being practised, the ewes should be fed in a different place each day to prevent them standing about in the same area waiting for the feed to be put out. By adopting this practice the sheep will obtain natural exercise. This practice applies more particularly under drought conditions and when self-feeders are not being used. When self-feeders, troughs or hay racks are used, these receptacles are most advantageously placed at the opposite end of the paddock to the dam or other water supply. This also ensures that the sheep receive exercise. It is essential that the number of self-feeders, &c., in use be sufficient to avoid overcrowding, and it is a good practice to draft the weaker sheep into separate paddocks. Further, as a means of preventing the onset of pregnancy toxaemia, the feeding, through the pregnancy period, of molasses which has a high food value, because of its sugar content, as well as laxative action, is recommended.

The second of these nutritional diseases is hypocalcaemia, sometimes termed milk fever in ewes. This condition affects both pregnant and lactating ewes and it may also occur in wethers, virgin ewes and young sheep. It is characterized by either an insufficiency of calcium or a disturbance of the calcium-magnesium ratio in the blood serum, or both. As a means of controlling the incidence of this condition, which is more commonly seen in lactating ewes on soft luscious pasture, the provision of a balanced ration during pregnancy is advised. Here again the feeding of molasses, which has both a high calcium and a high magnesium content, is undoubtedly beneficial.

Mention was made earlier in this chapter, when discussing mineral requirements, of the part played by minerals in maintaining the acidity and alkalinity of body tissues. Recent research work into toxaemic jaundice of sheep has shown that this condition is primarily due to an upset in the copper content of the body, and that the onset of the jaundice symptoms is preceded by a marked rise in the copper content of the blood stream. Further work has shown that when the blood stream can be kept alkaline, a reasonably high percentage of sheep recover. It is consequently advised that in known toxaemic jaundice areas a lick consisting of two parts salt, one part calcium carbonate, and one part sodium bicarbonate be provided for the sheep.

It will be noted that remedial measures against any disease mentioned have not been discussed in this article. It has been the aim solely to point out various control measures which can be, and should be, readily and regularly practised in good sheep management.

# Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.
Live Stock Science Officer

### *Molasses, Factory By-products, Inferior Hay*

AS a result of the drought and the acute shortage of fodder for hand-feeding much inferior fodder and many factory by-products, which are normally wasted, are being fed to stock.

Much grass hay cut towards the end of the year is still lying in the fields, and, consequently, when finally put on the market will be of very inferior quality. Unfortunately, it has not been practicable for the Prices Commissioner to fix a lower price for second quality hay than for hay of good quality, and those farmers who are forced to buy hay will probably have to pay the maximum fixed price for some of this inferior fodder. In the circumstances, buyers would be well advised to make sure they get good quality hay for their money.

Once hay has deteriorated, there is no means of restoring the lost nutrients which may represent half those in good quality hay. However, palatability of this inferior hay may be improved by sprinkling it with a mixture of molasses and water.

Molasses can be purchased in limited quantities at prices ranging from about 8s. per 4-gallon tin to £3 15s. per 44-gallon drum. At these prices, molasses may be dear as a general food, but as an appetizer the price is reasonable.

For sprinkling low-quality foods, a mixture of equal parts of molasses and boiling water is the best, although mixtures containing as little as 1 pint of molasses with 1 gallon of water are often successfully used.

Many claims are made for the beneficial effects of molasses, but when fed in the small quantities which are customary in this State, it has an appetizing value only. Where it is cheap and readily available, molasses may be fed at the rate of 8 to 12 lb. per beast daily, or 5 to 6 oz. per sheep daily. In these quantities molasses provides a large proportion of the nutrients, consisting mainly of easily digestible carbohydrate in the form of sugar. It is laxative also, due to the relatively large amount of potash. Laxative action of beet molasses is greater than cane molasses.

Molasses is used extensively by the manufacturers of mixed stock foods, and the palatability of these foods is due largely to the molasses.

Farmers are finding that many by-products, which are normally wasted, such as pea vines and pods, orange peel and pulp, lemon pulp, cocoa shells, peanut skins, distillers' and brewers' slops, grass and vegetable seed screenings and other fruit and vegetable refuse make useful feeds when they can be purchased reasonably. Some of these by-products such as cocoa shells, lemon pulp and ground bean seeds may not be palatable without a sprinkling of molasses and mixing with other feeds.

Stock feeders who desire advice on the feeding of by-products may apply to the Director, Department of Agriculture, Melbourne, C.2, when the information will be readily supplied.

### *Beef Cattle*

Detailed particulars of observations made on Aberdeen Angus and Hereford beef cows on pasture without supplementary feed, over the months of July, August, and September, were contributed by Professor Johnstone-Wallace at a joint meeting of the Institute of Animal Behaviour and the British Society of Animal Production, held in London last year.

During the 24 hours the cows spent from seven to eight hours grazing, but of this time only about five hours could be counted as actually employed in gathering the herbage, as the remaining time was spent in walking short distances and selecting the areas to be grazed.

On the average, 60 per cent. of the grazing was performed by day, when the average distance travelled was 2 miles, and about 40 per cent. by night, when the cows travelled only half a mile.

With a dense sward of from 4 to 5 inches in height, representing about 4,500 lb. per acre, each cow was able to consume about 150 lb. of green herbage containing 32 lb. of dry matter daily. As the amount of green herbage decreased through grazing to 2,200 lb. and 1,100, respectively, the daily intake was correspondingly reduced to 90 lb. (20 lb. dry matter) and 45 lb. (10 lb. dry matter).

On a pasture containing about 5,000 lb. of green herbage, about 10 inches high, the average daily intake was only 70 lb. (20 lb. dry matter).

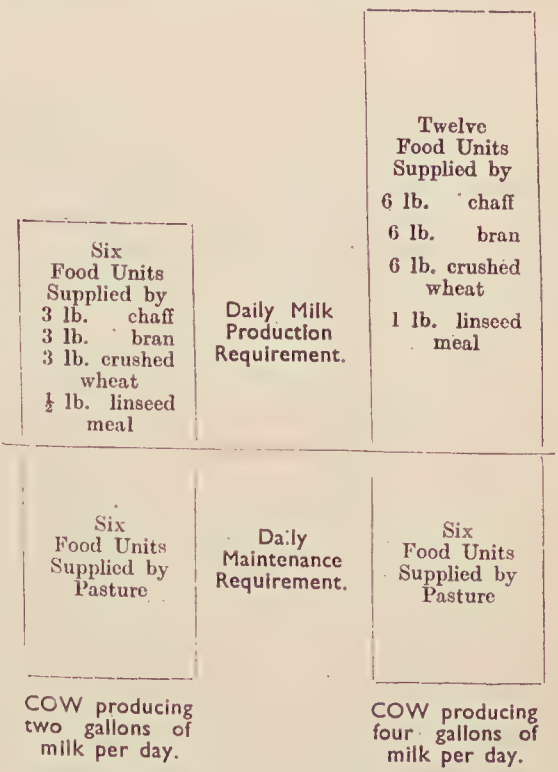
The following information for the 24-hour period was also obtained—Time spent in lying down, 12 hours; time spent in chewing the cud, 7 hours; frequency of defaecation, 12 times; amount of manure dropped, 46 lb. covering 8 square feet; frequency of urination, nine times; frequency of drinking, once only and usually in the late afternoon; and frequency of suckling the calf, three times each of about fifteen minutes at eight-hour intervals.

### *Feeding Dairy Cows for Economical Production*

Cows vary in their inherited capacity to produce milk, but the greater yield of a high-producing cow is not due, as is sometimes thought, to its ability to produce more milk from the same amount of food than a poor one. The stimulus to secrete an abundance of milk results in a keen appetite in the good cow and, when the feed is available, she will eat more than the low producer. If not fed liberally, her yield will decline in accordance with the quantity of nutrients consumed. On the other hand the low producer cannot increase her milk production beyond her inherited capacity, and excess nutrients are stored in the form of fat.

The maintenance requirement of cows of equal weight is approximately the same, but the proportion of the total food consumed which is available for milk production varies according to the yield of the cow. This is illustrated in the following diagram, which shows the number of food units required for the maintenance and for the milk production of two cows, each of 1,000 lb. weight, and supplying milk with a butterfat content of 4·5 per cent., one cow giving 2 gallons per day and the other 4 gallons per day.

During the autumn and winter pasture usually provides sufficient nutrients for maintenance only, therefore supplementary rations are necessary. Suitable mixtures for the two cows are indicated in the diagram:—


Six Food Units Supplied by
3 lb. chaff
3 lb. bran
3 lb. crushed wheat
½ lb. linseed meal
Daily Milk Production Requirement.
Twelve Food Units Supplied by
6 lb. chaff
6 lb. bran
6 lb. crushed wheat
1 lb. linseed meal
Six Food Units Supplied by Pasture
Daily Maintenance Requirement.
Six Food Units Supplied by Pasture
COW producing two gallons of milk per day.
COW producing four gallons of milk per day.

The two-gallon cow requires half of her ration for maintenance, while the four-gallon cow needs only one-third of her ration for maintenance. High-yielding cows, therefore, produce milk more economically than low-producing cows, and dairy farmers who feed concentrates to their stock will increase the

return over feed cost by intelligent feeding. It is of fundamental importance to feed concentrates according to the production of the cows in a herd. If all the cows are fed alike, the good ones will most probably be under-fed and the poor ones over-fed. Profitable production comes neither from cows which are half starved, nor from those that are over-fed, but from those that receive a sufficient quantity of the right kind of food.

[J. T. Kelly, B.Agr.Sc.,
Science Field Officer.]

### *Machine Milking Methods*

Those of us who were instructed in the art of milking several years ago were impressed with the necessity to strip out the last drop of milk from a cow. When machine milking became common, it was natural to continue this practice of thorough stripping. Now, in all the chief dairying countries of the world, it has been advocated that stripping by hand be reduced to a minimum or discontinued altogether.

Although the pros and cons of stripping and non-stripping have been threshed out wherever dairy farmers meet, it will repay us to re-examine the question. If it is found that machine milking without stripping is efficient, that there is no drop in milk yield and no damage to the cow, then non-stripping will prove a boon to dairy farmers who are in difficulties from shortage of labour.

To understand the effects of milking practices on the cow, it is first necessary to inquire how milk is formed in the udder, and then "let down" at milking time.

All round the clock the secreting tissue in the udder is manufacturing milk, using substances from the blood as raw materials. The milk is stored in the many small cavities and the large milk cisterns of the udder until milking time. Then, when the cow is prepared for milking, a substance known as a hormone is liberated in the blood, due to various nervous stimuli such as being bailed up, the sound of rattling buckets, and the washing and handling of the teats when the foremilk is being examined for abnormalities. This hormone causes the tiny muscles in the walls of the milk cavities to squeeze out the milk into the milk cisterns. This is how the milk is "let down." The faster milk can be taken away by the milker at this stage, the more completely will the cow milk out. Any upset in the cow's routine or excitement or worry from other causes will interfere with the "letting down" process. This explains the necessity of keeping a fixed routine without any disturbances to the cows in the yard or shed.

With few exceptions, it has been found that cows which are accustomed to being rapidly milked let their milk down completely, so that there are very little strippings. Although the strippings are very rich in cream, it has been found in herds under test that there is no loss of butterfat through not stripping. This is because the strippings are not lost, but are mixed with the next lot of milk being formed.

Many of those who have discontinued to strip their cows have found that they have less mastitis. This seems to be due to less bruising of teat and udder tissues caused by stripping. Leaving the machines on the cow after she is milked out, or running them at too high a vacuum, may similarly act as predisposing causes of mastitis. The lower the vacuum at which the machine can be run, the less risk there is of causing any trouble. A vacuum of 13 inches has been found to be sufficient for most machines, but under no circumstances should it exceed 15 inches.

If every care is taken in starting the cows and removing the machines as soon as milking is completed, in a remarkably short time any necessity to strip will disappear. Non-stripping, which has often been adopted as an emergency measure due to lack of labour, has come to stay because of its efficiency.

[L. P. Prewett, B.V.Sc.,
Veterinary Stock Inspector.]

### *Importation of Stud Pigs*

Several consignments of stud pigs have been imported to Victoria and to other States during recent months. They include Large Whites from Canada and New Zealand, Berkshires from New Zealand, and one from England, and Tamworths and Large Blacks from New Zealand.

The Australian pig population, which has descended from importations, may include a sufficient number of families in the more common breeds to carry on without further importations. Also, the best pigs of each breed in Australia may be equal to the best in other countries. However, the importation of new animals can have very desirable effects.

The importation of stud pigs to Australia entails cost and risk which few breeders are prepared to accept. However, the stud breeders

who are unable to import are usually anxious to secure some of the early progeny of the imported stock in their endeavour to add desirable features to their herds, and to avoid deterioration which might occur through close breeding. These stud breeders, in turn, pass on the best of the stock they breed to the men who grow what are generally called the commercial pigs. Thus, importations can give a general impetus to pig breeding.

The benefits available to the pig industry through continuous introduction, trial, selection and propagation of superior pigs are not fully availed of unless all pig breeders use the best available stock.

There are still many pig breeders who lose money through keeping breeding stock which do not produce sufficient numbers of fast-growing progeny capable of making first-grade carcasses.

The purchase of a superior boar for, say, 15 guineas, as compared with an inferior boar costing £5, is a sound investment if the dearer boar sires, say, 150 pigs in his life, and if, as might be expected, each of his progeny reaches market weight two weeks quicker and is worth 3s. more at auction than the progeny of the cheaper boar.

[L. A. Downey, H.D.A., Pig Expert.]

## *Geese*

The two principal breeds of geese are the Toulouse and the Emden. The standard weights are as follow:—

Toulouse gander, 20 lb. to 26 lb.; goose, 16 lb. to 20 lb.

Emden gander, 18 lb. to 20 lb.; goose 16 lb. to 18 lb.

The Toulouse goose originated in Toulouse, in Southern France, and is the largest variety known. In colour it is dark-grey on the back, shading to light-grey and white on the breast, and white on the abdomen. The eye is brown, the beak lightish orange, the feet and webbing orange. The body is massive, broad and deep, of medium length, practically touching the ground. The female lays from about 18 to 36 eggs a year, but it is not a good sitter.

The Emden goose originated at Bremen, in Germany, and is pure white in colour, hardly as large as the Toulouse, but more upright. The female lays nearly as well as the Toulouse, but is a better sitter.

The young goslings grow quickly and mature early. Where hatching by hens is practised, the usual custom is to give four goose eggs to one hen, the hatching period being about 30 days.

Geese subsist largely on grass, which they graze fairly closely, and other stock do not care to follow them on pasture land. They can be housed very economically, as they need protection only from the wet.

### Breeding.

The gander is usually larger than the goose. The cry of the goose is somewhat shrill; the male has a more guttural note. He is also usually rather lighter in colour than the females. A male is best mated with not more than four geese.

The smallness of the geese in Victoria is partly due to the custom of breeding from very immature stock. Geese are not really mature until the third season, and may be kept on for another three or four seasons afterwards.

### Hatching.

The eggs should be removed regularly as laid, and set under hens. If the eggs are not removed, the goose will stop laying sooner than she otherwise would. Eggs set under a hen should be turned regularly as they are rather large for the hen to turn. About eleven eggs may be set under a goose. Although the use of incubators for goose eggs is uncommon, there is no reason why they should not be used. With goose eggs, the machines should be run at from about 101·5° to 102·5° Fahr., and kept rather more moist than is usual with hen eggs. The young goslings hatch somewhat slowly under hens. They should be carefully watched for head lice, to prevent which some lard may be smeared on the head.

### Feeding Young Goslings.

No feed need be given for the first 36 hours or so, although fresh water may be provided; also plenty of grit. Bread crumbs and milk may be given as a first feed, with finely-chopped greenstuff. Barley meal, ground wheat, pollard, and maize meals may be given for the next two or three weeks, after which—if plenty of greenstuff is available—they will need only about one feed a day.

### Fattening for Market.

When being topped off for the market, geese should be kept confined in small flocks of twenty or so, and fed on oat pollard, wheat meal, barley

meal, and maize meal, with any separated milk that may be available, and green feed once a day. The birds should be disturbed as little as possible, and will put on 4 to 5 lb. in approximately one month.

[H. F. Clinton, Poultry Expert.]

### *Bee-keeping*

With the approach of autumn, the first consideration of bee-keepers should be the transferring of bees from localities where little or no headway is being made to more favourable areas, where sufficient pollen and nectar may be gathered to provide a surplus for each individual colony, to be used as food during winter. With the sparse blooming of native trees in many districts, this may prove a serious problem. Thistles and other ground flora will provide a certain amount of relief where available. If previously showing bud, the following eucalypts are due to bloom during late summer and autumn:—Manna gum, sugar gum, messmate, stringybark, ironbark, and grey box. It has been noted that the budding of the trees mentioned is very irregular, and in some cases lack of moisture in the soil has been responsible for buds withering and falling before they reach maturity. The blooming period of red gum has now ended, most of the surplus honey from that source has been removed from the hives, and migrating bee-keepers are seeking fresh fields.

At the time of writing, in direct contrast to the northern part of the State, wet weather and rank growth have been responsible for clover in South Gippsland failing to yield a normal supply of nectar, but such conditions will probably prolong the blooming period, and should such be the case, there is yet time for a normal yield of clover honey.

[J. W. Thomlinson, Apiary Inspector.]

# Tubercle-free Herds

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

| Name. | Address. | Number in Herd. | Name. | Address. | Number in Herd |
|---|---|---|---|---|---|
| Aboriginal Station | Lake Tyers | 109 | Maloney, P. J. | Tongala | 66 |
| Armstrong and Son | Wangaratta | 105 | Murray, M. G. | Lima | 26 |
| Ballarat Orphanage | Ballarat | 105 | McNabb and Son, G. A. | Irrewillipe East | 154 |
| Banyule Stud Pty. Ltd. | Wangaratta | 54 | Nancarrow Bros. | Kerang | 47 |
| Black, I. S., Estate | Mount Noorat | 53 | Noonan, G. | Benalla | 31 |
| Cribbes, T. | Wangaratta | 39 | Noonan, Mrs. S. A. | Benalla | 35 |
| Deering, J. T. | South Wangaratta | 61 | Northcote Children's Farm | Bacchus Marsh | 165 |
| Dennis, Mrs. A. A. | Frankston | 23 | Onley, W. H | "Glenholme," Caldermeade | 67 |
| Dookie Agricultural College | Dookie | 85 | | | |
| Geelong Grammar School | Corio | 78 | Parker, Mrs. L. M. | Tallarook | 67 |
| Gorman, A. W. | "Cathcart," Alexandra | 57 | Payne, A. E. T. | "Yarra View," Lilydale | 66 |
| Griffin, G. W. | Gladysdale | 49 | Payne, E. N. | "Woodburn," Kilmore | 44 |
| Griffiths, J. G. | Benalla | 121 | Poole, M. A., and D. | Caldermeade | 155 |
| Henry, J. A. | Warrnambool | 53 | Poole, M. A., and D. | Yannathan | 79 |
| Howlett, Mrs. G., and Miss E. Samuel | Lang Lang | 55 | Powell, T. S. | "Carellen," Mansfield | 43 |
| Jakobi, L. W. | "Granada," Yannathan | 82 | Richardson Bros., Messrs. | "Faldinghurst," Upper Beaconsfield | 30 |
| Kane, F. E. | Warrnambool | 28 | Roe, Thomas H. P. | Cobram | 27 |
| Kilmany Park Farm Home for Boys | Sale | 105 | School of Horticulture | Burnley | 6 |
| Lady Talbot Milk Supply Co. | Cranbourne | 479 | State Experiment Farm | Rutherglen | 37 |
| Lawrence, P. H. | "Rainga," Tarrawarra | 83 | State Research Farm | Werribee | 245 |
| Longerenong Agricultural College | Dooen | 48 | Stephens, Dr. F. | Vermont | 32 |
| | | | Vagg, T. R. | Officedale | 45 |
| | | | Wells, W. G. | Caldermeade | 65 |
| | | | Woodyer, P. A. | Mornington | 19 |

In addition to the above-mentioned herds there are 813 commercial dairy herds containing 20,577 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they can not be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

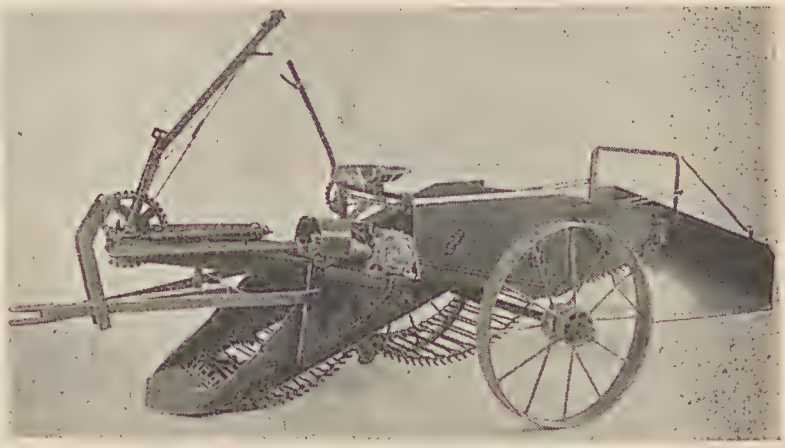
There are also 435 herds in which 12,176 head of cattle have passed one test, and may be considered, therefore, to be in process of becoming tubercle-free herds.

# War Agricultural Committee Notes

Compiled by the Central Executive

### *Mechanized Potato Farming*

THE replacement of manual labour by machines in the potato fields has been gaining in favour with growers in all parts of the world and is a desirable advancement. Mechanical one- and two-row planters and mechanical diggers have been in general use in England, Canada, and the United States of America for the past decade or more, and have undoubtedly improved conditions of labour and production on the farms. It is claimed that greater acreages can be sown and harvested by mechanical aids under better conditions than has been possible by manual labour. A one-row planter, with fertilizer-attachment, will plant six to eight acres a day, at the right period, without any rush and scramble, and a mechanical digger will lift the crop at the rate of five acres per day at maturity, with less damage to the tubers than that caused by inexperienced fork digging, and with an increased net return to the growers.

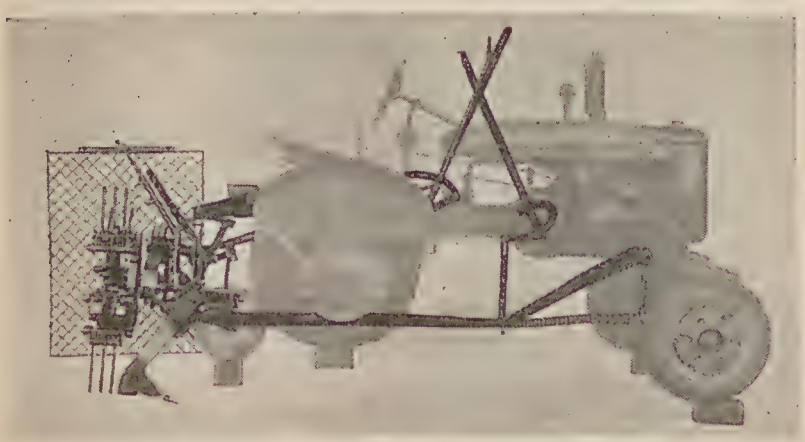


The "elevator" type mechanical potato digger.

A small number of imported Independent one-row planters, with fertilizer attachments, have been used in Victoria during the sowing season with varying degrees of satisfaction and success, but sufficient has been learned of the machines to state that, with adaptations necessary to meet the different conditions prevailing in Australia to those for which the machines were designed, the planters can be made to do the job more satisfactorily than by hand.

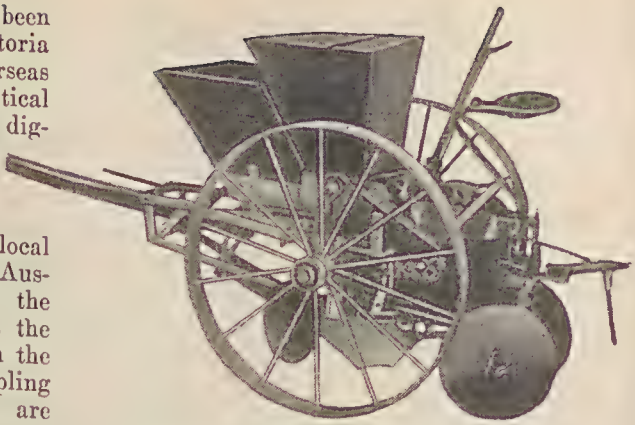
One-row planters are now being manufactured in Australian factories, which will improve on imported designs in regard to suitability for local requirements and conditions, and growers will be wise to investigate the possibilities of the Independent potato planter, and arrange for supplies in ample time for next year's planting.

In regard to the mechanical potato digger, it can now be accepted that the



The power-driven "spinner" type potato digger.

power take-off machines which have been developed and manufactured in Victoria during 1944 are an improvement on overseas designs. These have been tested under practical conditions in the field and have done the digging efficiently and satisfactorily in most classes of soil, under reasonably dry or wet conditions.



One-row, two-horse, one-man potato planter with fertilizer attachment.

Two designs have been selected for local manufacture as the most suitable for Australian requirements. One is known as the steel "Elevator" type, and the other as the "Spinner." Both are functioned through the medium of a power take-off shaft and coupling by the tractor. Horse-drawn designs are driven from the ground wheels, but it is generally conceded that the power take-off drive is more reliable and satisfactory in general operation for large areas. Each is built to dig rows of 27 to 36 inch spacing. At the front end is a hardened steel digging share, cutting approximately 24 inches wide, and adjustable to a depth exceeding that necessary to get below the lowest growing potatoes in the row. With the "Elevator" type, potatoes and soil move over the share on to a moving apron or elevator, which traverses a distance of approximately 9 feet before returning at the end of the machine, and depends on vertical agitation in its run over the sprockets to separate the soil from the tubers.

The "Spinner" type, as its name implies, handles the potatoes by a rotating action or spinner to get rid of the soil. Stone fenders are fitted at the rear of the share to prevent stones passing through the mechanism. When the potatoes are freed of soil by the "Elevator" agitators or "spinning" process, they are delivered into a tray and diverted into a neat row, ready for the men picking up. Lifting levers and adjusting linkage, to suit various makes of tractors and regulate digging depths, are fitted and are accessible and easy to operate.

The advantages of power take-off mechanical potato diggers are recognized by growers not only as an answer to the man-power shortage on the farms, but also because of the lessening of damage to tubers, and thereby increasing the return to the growers. By the adoption of mechanical planting and digging, growers will also be able to increase areas and harvest double the acreage possible than when relying on manual labour. The power take-off potato diggers will lift and deliver potatoes into rows at the rate of five acres in eight hours of normal operation, and enable the crop to be dug when it has matured, and before the weeds have taken charge late in the season. Such factors are of great advantage in helping to keep the paddocks clean and in good condition, as well as allowing more time for preparation for the next crop.

To get the best results from mechanical digging greater care in regulating the width of the rows should be practised, and the adoption of mechanical planting, as well as digging will prove advantageous. Greater care in the management of the potato crop from planting to harvesting is advocated.

The present method of marketing to sample and delivery by quotas necessitates careful consideration, in advance of digging, of the methods to be employed in handling the crop. Some growers are finding it more convenient to hold the crops in the shed or pits and bag as required for delivery. Such a practice has a good deal to commend it. The tubers are dug when they are ready and are available for transport at short notice, whenever required for market. That phase of the problem is one for the personal decision of the grower, according to the equipment and labour available in his area during the marketing period.

It is suggested that the contract system of mechanical planting, digging and gathering of potatoes is worthy of careful survey and organization in potato-growing districts, particularly amongst the smaller growers who do not possess tractors. In present circumstances there are not enough tractors, planters or

diggers to supply the demand, nor is it economical or necessary for numbers of individual growers to make such a heavy capital investment. It would be much better for one individual in the vicinity to make the arrangements necessary to purchase the equipment, on the understanding that he will plough, plant, and dig for others by private contract on a per-acre basis, according to prearranged rosters. It may be said that planting at the right time would offer difficulties, but there would be nothing to prevent any grower going ahead with part of the planting, while awaiting the contractor to pull in when available. A practical plan of this kind should prove profitable to growers and private contractors alike in suitable areas, and go far to solve the man power and equipment problems with which growers are faced.

Mechanical diggers are not likely to be available in sufficient numbers during the early digging season in 1945 to satisfy the demands of individual growers, nor can tractors be obtained at will. It is suggested, therefore, that the private contractor system should be organized and inaugurated promptly in the earlier districts, where the crops show promise and sufficient labour will not be available for the digging.

A small number of mechanical diggers have been reserved by the Department of Agriculture, with a view to making them available for purchase by contractors who will undertake to assist growers to harvest the early crop. These machines can be obtained by outright purchase for cash or by favourable terms of hire purchase, provided the applicants are approved by the District and Local War Agricultural Commitees.

It is hoped the suggestions that have been made will be taken up by the Local and District War Agricultural Committees concerned for discussion with growers at an early date. Early application to obtain the available equipment will be necessary, and preference will be given to applicants who intend to service a number of growers, rather than to individuals requiring machines for personal use only.

# Build Good Nests for Poultry

It is difficult to design a standard nest suitable to the various types of poultry house but many poultry farmers could do a great deal more than they are doing to improve nesting facilities. Much wastage due to dirty, cracked, broken and heat-affected eggs, and egg-eating, is the result of poor nesting accommodation. If this wastage could be measured it is quite possible that the amount of money lost would be more than sufficient to pay for the installation of better nests.

The nests should be arranged inside the pens on the partition walls and away from the weather. Place them about two feet from the ground so that they do not take up floor space. Gathering of eggs should be done several times a day. Cover the nests to keep them fairly dark and secluded, and make sure that the cover has sufficient slope to prevent the birds from roosting on it. The nests should be closed at night to prevent the birds from roosting in them. One nest should be allowed for every six or seven birds if individual nests are used. If community nests are installed, allow 4 ft. 6 in. by 2 feet for every 50 birds. Make the nests 10 to 12 inches deep so that the litter cannot be scratched out. Clean, light litter such as rice hulls is suitable nesting material.

*Clean, roomy, secluded nests produce clean eggs. Small, dirty, open nests produce many dirty and broken eggs.*

Eggs are a valuable food and are urgently needed for the fighting services, the civil population and for overseas. It is essential therefore that every possible effort be made to prevent waste.

[Contributed by the Live Stock Division.]

# Seed Certification in Victoria

## List of Growers and Registered Areas Approved for 1944-45 Season

SEED certification schemes are in operation in Victoria in respect to the following species and strains of pasture seeds:—

1. Victorian Perennial Rye Grass.
2. Tallarook "Late Flowering" Subterranean Clover.
3. Bacchus Marsh "Early Flowering" Subterranean Clover.
4. Victorian Phalaris tuberosa.
5. Victorian Irrigation White Clover.

The approximate areas for which application has been made, and approval granted, for the current season are set out hereunder:—

| | |
|---|---|
| Victorian Perennial Rye Grass .. .. | 3,000 acres |
| Bacchus Marsh Subterranean Clover .. .. | 190 acres |
| Phalaris tuberosa .. | 100 acres |
| Victorian Irrigation White Clover .. .. | 80 acres |
| Tallarook Subterranean Clover .. .. | 40 acres. |

As a result of the unfavourable season in most of the seed-growing areas, the area of perennial rye grass approved for the production of certified seed is considerably less than usual.

Growers approved for the 1944-45 season are as follow:—

### 1. Victorian Perennial Rye Grass.

R.G.— 1. Pickford, A., Clunes.
6. Toose, H. A., Smeaton.
20. Pickford, J., Clunes.
47. Bunn, J., Allendale.
54. Hives, J. H., Kingston.
59. Armstrong, J. R., Allendale.
72. Ford, E. H., Tourello.
74. Redman Bros., Smeaton.
99. White, R. T., Cardigan.
102. Higgins, F., Irrewarra.
104. Currington, A. H., Warncoort.
107. England, S. C., Warncoort.
108. England, W. G., Warncoort.
109. Hay, J., Colac West.
112. Hawtin, F., Colac West.
118. Martin, H. L., Irrewarra.
119. Menzel, C., Armytage.
125. Roache, J., Nalangil.
126. Roache, P., Nalangil.
128. Ryan, D. M., Nalangil.
R.G.–133. Rankin, A., Colac.
140. Dignan Bros., Warncoort
154. Smith, S., Colac West.
158. Spalding, J. A., Larpent.
160. Billing, F., Colac.
163. Inglis, T. W., Larpent.
166. Inglis, A. D. C., Larpent.
172. Conheady, J., Nalangil.
199. Ryan, H. L., Irrewarra.
225. Trewhella, C., and A. B., Newham.
258. Moloney, P. G., Terang.
278. Kennedy, M., junr., Winslow.
297. Fitzgibbon, P., Mortlake.
298. Hermann, O. G., Croxton East.
299. Peavey, J., Hedley.
306. Walton, W. A., Burrumbeet.
318. Tennant, S., Lawrence.
320. Mezzeni, W., Kooroocheang.
331. MacRae, C., and J. M., Tourello.
332. Nicholls, P., Kooroocheang.
133. Charleson, J., Kooroocheang.
406. Roache, D., Nalangil.
407. Menzel, A. A., Winchelsea.
408. Walsh, J. M., Swan Marsh.
409. Baudinette, Mrs. I. F., Larpent.
411. Sutherland, A. J., Nalangil.
418. Williams, O. M., Colac.
424. Nicholas, A. H., Birregurra.
438. Johnston, S. A., Birregurra.
443. Warrowie Estate, Irrewarra.
450. Champness, P. L., Mt. Moriac.
463. Inglis, G., Warrion.
465. Middleton, J. J., Nalangil.
470. Trigg, E., Cororooke.
479. Stinchcombe, E. W., Colac.
485. Farquharson, J., Deans Marsh.
486. Ryan, F. P., Nalangil.
487. Higgins, J. T., Irrewarra.
488. Peel, H., Colac.
489. McDonald, J. J. and Sons, Yeodene.

### 2. Tallarook Subterranean Clover.

T.K.—5. Head, A. C. and Son, Shepparton.

### 3. Bacchus Marsh Subterranean Clover.

B.M.—4. Koch, L. T., Wando Vale, via Coleraine.

### 4. Phalaris Tuberosa.

P.T.— 9. Buchholz, L. G., Lismore.
16. Habel, L. V., (Mrs.), Yulecart, via Hamilton.
17. Champness, P. L., Mt. Moriac.

### 5. Victorian Irrigation White Clover.

I.W.—2. Hamley, H. J., Dingee.
3. Jackman, J. W., Dingee.
7. McEwen, J., Stanhope.

# A MESSAGE TO IRRIGATORS

## Problems at Cobram

By R. S. HARPER, B.Agr.Sc., Officer in Charge, Horticultural Research Station, Tatura

Irrigating peach trees in the Goulburn Valley.

THE proper use of irrigation water, and the maintenance of irrigated fruit trees in good health for long periods, require the highest degree of agricultural skill. No general rules can be laid down, but each irrigation district, and each soil type within that district, demand critical study.

The purpose of this short report on some preliminary work done at Cobram, before more urgent war work caused its suspension, is to show that deterioration of recently established horticultural areas resembles what has apparently occurred in the older Goulburn Valley areas.

The Goulburn Valley irrigation area is a prosperous district with large and extensive horticultural industries; its food processing works are among the largest in the Southern Hemisphere, and its export trade is considerable. However, the fact that some major projects have had to be abandoned or drastically modified during the 30 years of its active life should not be overlooked. Citrus production, for example, was a major horticultural industry in the early days of the settlement, but many groves died out after a few years and few are left now. Canning peaches were planted and grew wonderfully well, but under Goulburn Valley conditions they have a commercial life of some 20 to 25 years only, and growers have found that peaches and apricots cannot be replanted satisfactorily on old peach ground, even after fallowing or alternately cropping it for two or three years.

Pears, however, can be grown after peaches —they are more tolerant of soil moisture fluctuations, and consequently more convenient to irrigate on difficult soils. The replacement of peaches with pears has led to an increase in the district acreage of pears, which are now the

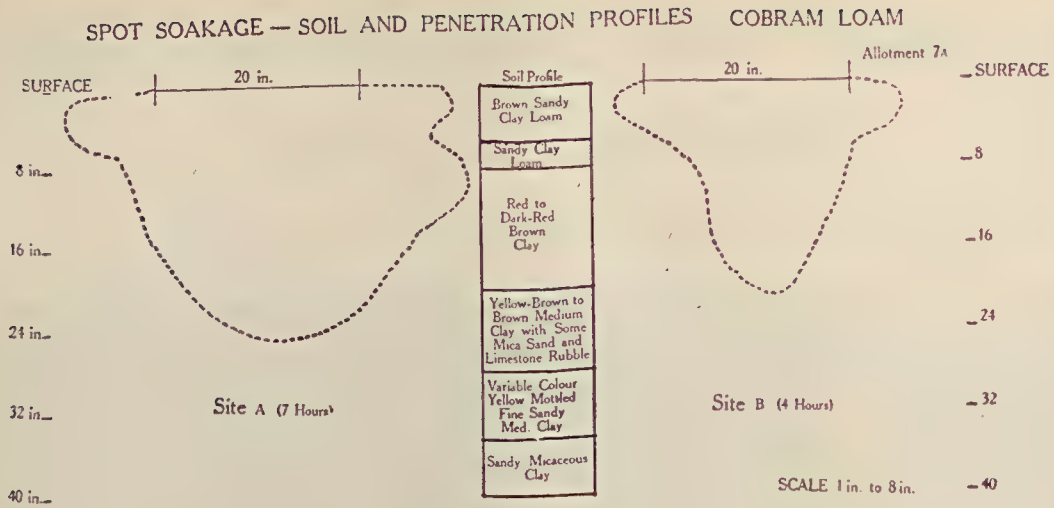



Fig. 1. (See page 69.)

mainstay of the fresh fruit export trade, and also provide an increasing proportion of canning fruit. A stage has been reached when many of the peach orchards are in need of replacement, and growers, who are not fortunate enough to have new ground on their existing properties, are looking further afield for expansion. In certain areas, pastures are replacing old orchards.

Local opinion has it that in the early days of the settlement, Goulburn Valley soils were easily watered and cultivated. Irrigation water penetrated without difficulty. At the present time, on most orchards, efficient irrigation is difficult and soil management is a problem confronting most growers. Citrus-peaches-pears-pastures—this series of crops tells the story of the change in soil texture from comparatively light and open, to heavy and relatively impermeable. What is the cause of this marked change? Undoubtedly, it is due largely to inefficient irrigation and faulty soil management.

The newly-opened irrigation district around Cobram has large areas of friable, open soils. Peach growers from the older Goulburn Valley areas are turning their attention to Cobram, and are planting up relatively large areas of canning peach varieties. In these early years they are growing wonderfully well; but what of the future? Will Cobram soils become as tight and difficult to irrigate as those of the older Ardmona, Kyabram, and Shepparton areas?

Cobram has had a good start. Its irrigation system is laid out with the guidance of 50 years of experience with irrigation in the Murray Valley. An extensive soil survey has been made, delineating the soil types and specifying their suitability for various uses. There is no appreciable quantity of salt within 10 feet of the surface. The water table, where one has been found, is 20 feet down. Surface and underground drainage are both good.

Soil deterioration and failure can come, however, through individual ignorance or carelessness in irrigation. A strong community conscience for the preservation of Cobram as a first class irrigation area is necessary, and provision should be made for adequate continuous investigation and advisory work.

In 1941, a brief survey was made of irrigation practices being used in young orchards at Cobram. The impressions obtained were not good. The combination of a permeable soil and a cheap, abundant supply of irrigation water was too much for several growers—water was used lavishly and too heavily. One- and two-year-old trees, watered by a single furrow on each side of the row, received up to 3 acre-inches of water per watering, a quantity sufficient for full-grown trees. One reason for this was the endeavour to obtain lateral soakage by holding the water in the furrow for two or three days. Another, and possibly the main reason, was the old error of bad layout—long runs, steep slopes, and poor grading. Under these conditions, vertical penetration was 8 to 10

feet, lateral penetration a few inches. The water below the influence of evaporation and the young tree roots—say, 18 inches downwards—stays there until the next irrigation, when it is pushed down by another 3-in. watering. How long will it be before such prodigality brings a water table near the surface, perhaps bringing salt with it—an even more serious problem, such as now faces many horticulturists in the Murrumbidgee irrigation area?

It has been shown by Penman (1) that irrigation is capable of washing clay particles from the surface soil to lower layers, where they accumulate and form a tight layer through which water penetrates only with difficulty. The heavier the waterings the greater is this effect. This, perhaps aided by unwise cultivation practices, appears to be the cause of the Goulburn Valley's difficulties. Unnecessarily heavy irrigation will undoubtedly accelerate this deterioration at Cobram. Are irrigators aware of these dangers? Some may be, but unfortunately, there are indications that others are not.

### *How Soon Can Soil Deterioration Commence?*

Following this preliminary inspection, the writer of this article was able to make a few determinations of soakage rates on typical horticultural soils. The results of these tests are illuminating and are set out here in the hope that they may be of some assistance to irrigators. The results are published now because further work, though a vital necessity, cannot be undertaken until additional staff becomes available, probably with the cessation of hostilities. It is evident from the work already done that a marked decrease in permeability can occur in as short a period as four or five years.

### *Apparatus and Experimental Technique*

The apparatus used to obtain a measure of the permeability of these soils was the "Spot Soakage" apparatus as developed by Pennefather (2) at the C.S.I.R. research station at Griffith, New South Wales.

With this apparatus, the principle of directly measuring the water absorbed from a small enclosed area is utilized. A steel frame 50 cms. (20 inches) square, driven 3 to 5 inches into the soil is used to confine water to the "spot" area, and the water is maintained at a constant depth of about one inch in the frame by feeding water from a supply drum with its outlet adjusted to the desired water level in the frame (see photographs). on next page). This drum is sealed at the top, and water flows from it only when the water level in the frame falls below the outlet and permits a bubble of air to enter the reservoir. A calibrated gauge on the supply drum is used to measure the rate of infiltration from the frame.

SPOT SOAKAGE — PENETRATION PROFILE — COBRAM LOAM

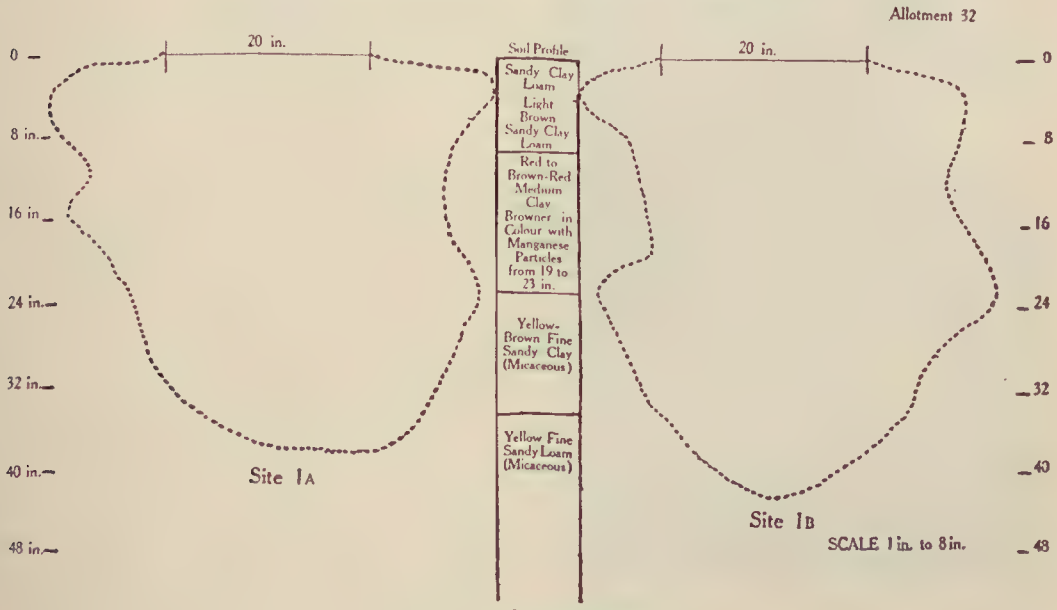



Fig. 2. (See page 70.)

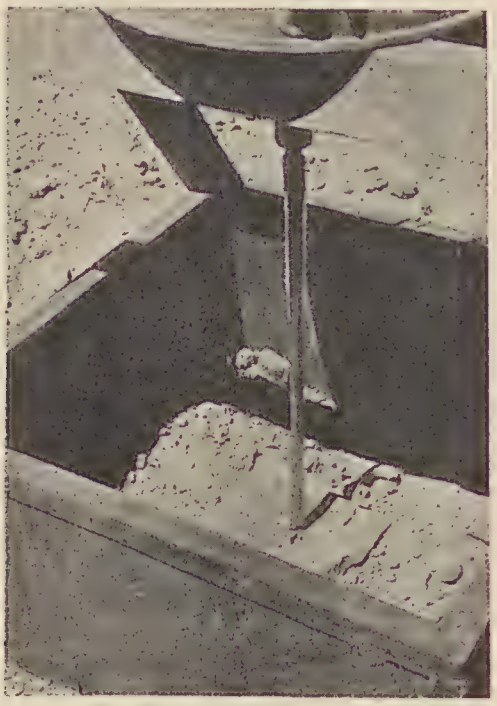
For comparative purposes, a standard soakage period of six hours is generally used, and the amount of water absorbed in this time can be expressed in terms of surface centimetres or surface inches applied.

Thirty-six to forty-eight hours after the infiltration test is completed, soil water has usually reached a state of equilibrium and the penetration profile is mapped out by trenching across the soakage area. Composite soil samples, in 6-in. steps down to the 3-ft. level, are taken in close proximity to the soakage area before starting the test, to obtain a measure of the soil moisture status prior to soakage. Similar samples are taken in the soakage area after the test, before trenching is started.

"Spot Soakage" apparatus set up for test.

### *Soil Types*

Two soil types, suggested by the C.S.I.R. County of Moira Soil Survey of 1938-40 (3) as suitable for fruit growing, occur over a fairly wide area in the Parish of Cobram, and in general are similar to, but rather lighter than, the main Goulburn Valley types.



A near view of "Spot Soakage" frame showing outlet and tray to prevent scouring of soil.

Typical profiles of these two types are defined in the above bulletin as follows:—

1. *Cobram Sandy Loam* (*Type* 11)—a soil of light to medium general texture, associated with sandy rises or lower slopes from sand-hills—

0 to 8 inches.—Brown sandy loam, structureless, hard, crumbly when dry, free plastic when wet.

8 to 18 inches.—Light-brown sandy loam similar to the surface 8 inches gradually working up through sandy clay-loam to—

18 to 27 inches.—Brown to red-brown sandy clay going to sandy medium clay, structureless, massive and hard when dry, plastic when wet.

27 to 36 inches.—Greyish-brown sandy clay or fine sandy clay; mellow to plastic, with slight limestone rubble.

36 to 72 inches.—Stratified yellow-grey-brown sandy clay loam, micaceous fine sandy clay or fine sandy clay-loam with trace of limestone rubble.

2. *Cobram Loam* (*Type* 15)—a soil of medium general texture, associated with well-drained brown plains—

0 to 6 inches.—Brown loam, frequently fine sandy to silty; hard and crumbly when dry, plastic to mellow when wet.

6 to 9 inches.—Bleached layer, light-brown sandy loam to sandy clay-loam; slightly cemented, slightly platey structure. (This horizon sometimes destroyed by cultivation.)

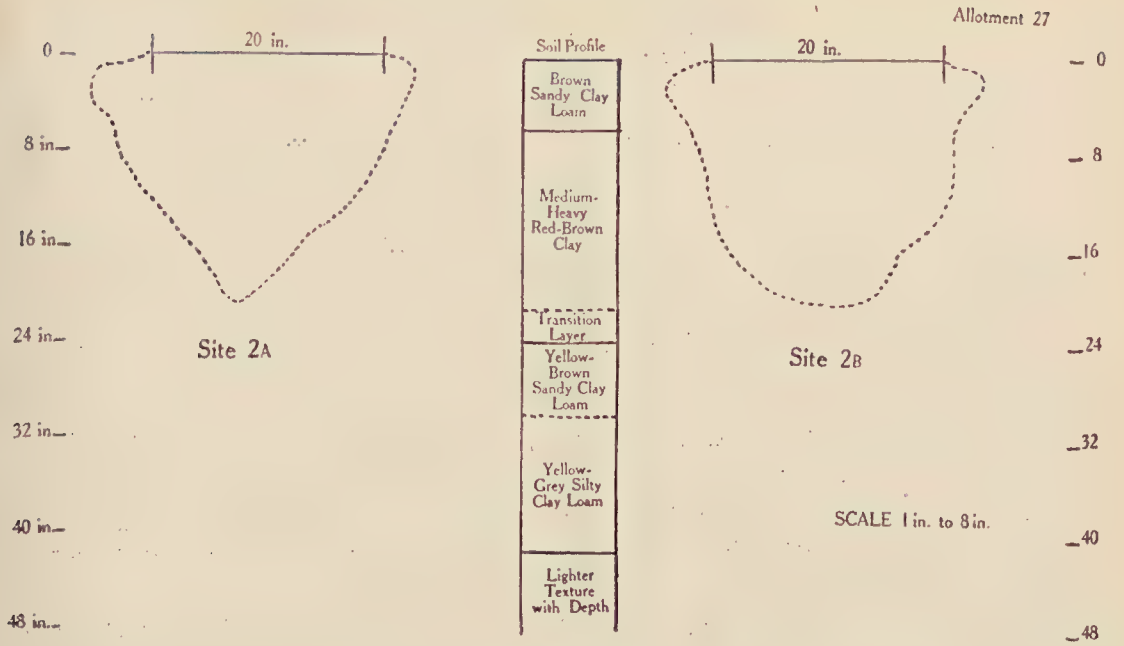



Fig. 3. (See page 70.)

9 to 27 inches.—Warm brown to red-brown heavy clay; hard and massive when dry, stiff to slightly friable when wet, with a blocky, hard fracture, and a few permanent cleavage lines through the mass. From 21 to 27 inches a transition of brown rather mellow clay to—

27 to 36 inches.—Yellowish grey-brown, slightly mottled, light clay passing to micaceous fine sandy clay; platey formation; granular structure, mellow to plastic when wet; slight limestone rubble.

36 to 72 inches.—Mottled yellow-grey-brown micaceous fine sandy clay tending to fine sandy loam, sometimes with strata of fine sandy loam; platey formation; mellow to plastic; slight limestone rubble.

The profiles of the soils, at the sites selected for the tests, corresponded to the typical profiles defined above. Slight variations occurred, and have been recorded for use in the interpretation of the soakage maps.

### *Soakage Time*

In a preliminary soakage trial, a comparison was made between "watering" for four hours and for seven hours on a Cobram Loam soil in a young orchard. The "penetration profiles," revealed by trenching across the soakage area 48 hours after watering, are shown in Fig. 1, together with a diagram of the soil profile. After four hours "watering" (Site B, Fig. 1), lateral penetration was not more than 5 inches, and that only in the surface layer. Vertical wetting was to 18 inches, and the wetted area 12 inches below the surface was only 1 foot in diameter. After seven hours' watering (Site A, Fig. 1) lateral penetration had increased only to 8 inches and vertical penetration to 24 inches, while the wetted area had extended to the full size of the soakage box (20 inches across), to a depth of 16 inches. The quantity of water used was equivalent to a 2½-in. watering.

It is evident that, in seven hours, a watering sufficient for mature trees could be given on Cobram Loam, yet this test was done in an orchard where water was run in furrows near young trees for three days. It is evident, too, that lateral soakage is negligible and that special measures must be taken to ensure water reaching the roots of young trees. No similar time data is available for Cobram Sandy Loam.

In April, 1942, some tests were carried out to discover any difference in permeability between irrigated and non-irrigated soils of the Cobram Loam and Cobram Sandy Loam types. Absence of early autumn rains had caused low pre-soakage moisture contents at the chosen sites.

### *Soakage in Cobram Loam*

Site 1 was on allotment 32, Parish of Cobram. It was in a stubble paddock which some years previously had been used for production of irrigated cereals, but had received only light waterings. No irrigation had been given for two years previously.

Site 2 was on allotment 27, Parish of Cobram. This area had been under irrigation for four to five years. Originally planted with summer fodder crops (sorghum, imphee, maize, &c.) it was at the time of the test under lucerne, which was seeded in the previous September. Despite regular watering, the lucerne had not made striking growth, and, when trenching, no roots were apparent below 14 inches. Irrigation practices on this property appeared to be sound.

The two soils, being of necessity some distance apart, were not exactly similar, but both corresponded sufficiently closely to the typical Cobram Loam. The soil at Site 2 was perhaps a little heavier than the type soil defined by the C.S.I.R. survey.

Figure 2 shows the penetration of water at Site 1 from two test "spots," a few feet apart, 48 hours after a six-hour watering, during which water equivalent to 8 acre-inches and 7 acre-inches was absorbed at the respective "spots." Penetration is chiefly vertical to a depth of 40 inches, which is very satisfactory.

Figure 3 shows the penetration profiles at Site 2 (irrigated lucerne) 48 hours after a six-hour watering. These "spots" absorbed water equivalent to 2½ acre-inches per acre. Lateral penetration is again negligible, and vertical penetration is poor, reaching only 20 inches. Soakage was still proceeding at the end of a six-hour watering, and a greater penetration could have been achieved by a longer watering. Nevertheless, the permeability of this irrigated Cobram Loam is in marked contrast to the practically unirrigated soil at Site 1—the volume of soil wetted is only about one-third of that of the latter site. Investigation in a similar neighbouring paddock, which had been irrigated two days before, showed that penetration had been achieved to only 21 inches.

It is possible that these two sites represent two extremes of permeability, and that a truer picture of the soakage to be expected in a Cobram Loam soil after a few years' irrigation is given by Fig. 1.

### *Soakage in Cobram Sandy Loam*

Site 3 was on allotment 69, Parish of Cobram. in an old wheat paddock which had been left in a rough stubble condition, and had never been irrigated.

Site 4, on allotment 7A, Parish of Cobram, was a young peach orchard, which had been cultivated and irrigated for two years. Previously it had been used for wheat-growing for

SPOT SOAKAGE — PENETRATION PROFILE — COBRAM SANDY LOAM

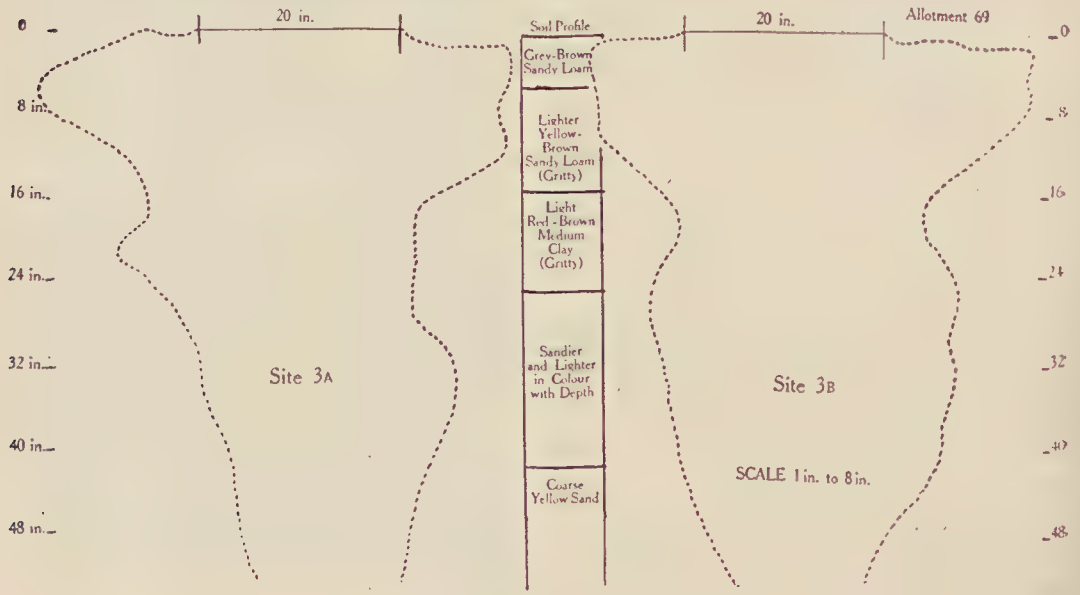



Fig. 4

SPOT SOAKAGE — PENETRATION PROFILE — COBRAM SANDY LOAM

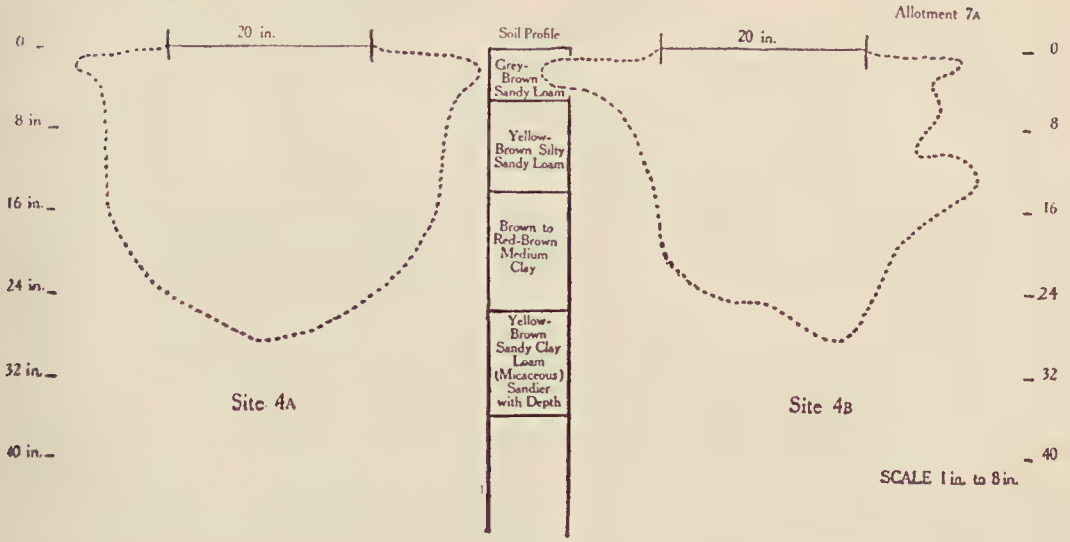



Fig 5.

a number of years and had not been irrigated. Both sites were on typical Cobram Sandy Loam.

Figure 4 shows the penetration profiles on two "spots" at Site 3 (non-irrigated). Lateral penetration to 12 inches in the first foot of soil is evident, and vertical penetration is enormous —about 4 ft. 6 in. No irrigation should penetrate to this depth. The water used was equivalent to 7 acre-inches and 6 acre-inches, respectively. It is interesting to compare this site with Site 1 on Cobram Loam, where more water was required to wet a smaller volume of soil. This may be ascribed to the greater amount of water necessary to bring the heavier soil (Site 1) from near wilting point to field capacity, as compared with the lighter sandy soil (Site 3), which was apparently not compensated for by the more rapid movement of water to be expected in the lighter soil.

Figure 5 shows the penetration of water at Site 4 (irrigated land). The lateral spread appears more restricted, and vertical penetration has reached 29 inches, which may be regarded as satisfactory.

Soakage was still proceeding at the end of the six-hour watering, and longer irrigation would have given greater penetration. However, the contrast with the non-irrigated soil at Site 3 is again marked.

### *Rates of Soakage*

The rate of water loss from the drum of the "spot soakage" apparatus is useful as a measure of the water soakage into the soil. Figure 6 shows graphs of soakage rates at each of the above sites. It will be seen that the rate of water soakage into the soil is at a considerably higher level on both non-irrigated sites and is in marked contrast to that on the two sites previously irrigated and cultivated, irrespective of soil type. In all cases, the soakage rate graphs (Fig. 6) indicate a fairly uniform soakage rate after the first two hours, with no tendency to slacken off after the six-hour period. This would lead to the conclusion that, if desired, a greater vertical penetration could be achieved by a longer soakage or irrigation period. The limit in this direction could be determined only by spot soakage tests over longer periods—but even for orchards there is no necessity for penetration below 3 feet.

### *Discussion*

Site 1 is representative of an area of Cobram Loam where cultivation and irrigation have been at a minimum, and which, from an irrigation point of view, differs little from virgin land; cropping operations have had little influence below the 6-in. level. Under these circumstances, packing of the soil and the formation of a plow sole have been avoided, and the washing down of clay particles has not

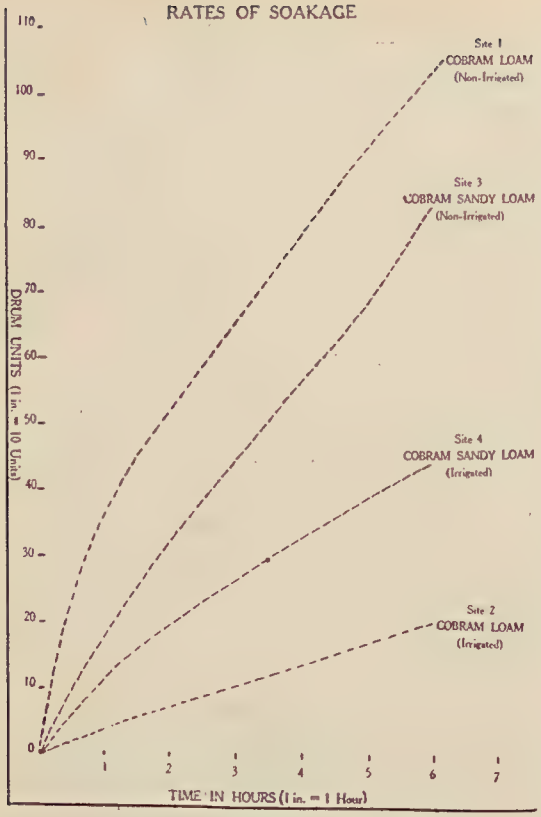



Fig 6

occurred, except during periods of excessive rainfall. In consequence, the soil has retained its granular structure, and permeability to water is good.

Site 2, on the other hand, is representative of those areas which have been under irrigated culture for a period of years. Deterioration of soil structure has occurred, due probably to over-cultivation, the failure to add organic matter to the soil through the agency of green manures—the loss of humus in these light soils under hot conditions is very rapid—and a tendency to use water too freely.

The cumulative effect of these factors has been a serious loss of permeability illustrated by the penetration profiles and soakage rates on Site 2 (Figs. 3 and 6). This may perhaps represent an extreme case, as the soil profile on this allotment contained a higher percentage of clay than was encountered elsewhere on Cobram Loam types, and, although shown on the soil survey map as a Cobram Loam area, it may actually be intermediate between this type and Moira Loam.

A similar deterioration of permeability is evident on the Cobram Sandy Loam types. The penetration profiles and soakage rates at Site 3 and Site 4 represent two similar, but not so widely placed, extremes as on Cobram Loam.

It is instructive to note that penetration to 3 feet compared with penetration to 2 feet requires the passage of approximately twice as much water through the top foot of soil, and allows twice as much leaching and washing of clay particles. The importance of achieving the correct depth of penetration is obvious.

### *How Long is it Necessary to Water ?*

The depth to which the soil need be wetted to field capacity will be determined by the nature and age of the crop grown, annual or perennial. With one- to two-year-old peach or pear trees, it is doubtful whether the effective root zone would extend to a greater depth than 12 to 18 inches, and applying water in quantities greater than that needed to wet down to the 24-in. level, is both wasteful and harmful.

Under soil conditions similar to those encountered in these soakage tests (with the exception of Site 2), six hours could be regarded as the maximum period over which water need be held on the soil to obtain a satisfactory depth of penetration. This should give a watering of about 4-acre inches.

The extent of the irrigated land at Cobram similar in behaviour to that at Site 2 (Allotment 27) is unknown, but, on such land, it would appear desirable to increase the time of water application to twelve to eighteen hours. No accurate advice in this direction, however, could be given without further investigation.

On Cobram Sandy Loam types, an effective irrigation period of four hours would seem adequate on those areas where deterioration in permeability is not yet evident.

### *Conclusions*

Enough has been revealed by these preliminary tests to show that rapid alteration in the soil structure is taking place under irrigation, and that the problem warrants intensified investigations on which to base a sound advisory service to growers.

Experiments in the Murrumbidgee Irrigation Area, and the experience of certain growers in the Goulburn Valley, suggest that a minimum of summer cultivation helps in the retention of soil structure and permeability, enables a

volunteer summer cover crop to become established, and this in turn, when plowed under in the autumn, adds to the organic matter in the soil.

In the meantime, until more precise experimental information is obtained, growers would be wise to follow the time-proven rules of good irrigation:—

1. Fix the length of run according to the soil type and surface slope. A length of four to five chains should be suitable for most soil conditions, but two or three chains is sufficient on light soil types such as Cobram sandy loam or the slopes greater than six inches per chain. In general, a slope of 1½ to 3 inches per chain facilitates control in watering and provides sufficient surface drainage in wet winters.

2. Use no more water than is necessary. The soil auger, which is as essential to the irrigator as a shovel, should be used regularly to decide when to irrigate, and how much water to apply. These requirements will depend on many factors, such as soil type, the age and variety of the trees, whether or not a cover crop is growing between the trees, the date of the previous application of water, the climatic conditions since that application and, of major importance, the moisture status of the soil at the time it is decided to irrigate.

Use the soil auger also to discover what happens to the water when it disappears from sight below the surface. By its intelligent use it is possible to determine whether irrigation has succeeded in moistening the root zone without wasting water in excessive penetration or creation of a water table.

3. Adopt irrigation methods to suit the soil type and slope of the land.

The multiple furrow, the contour check and the border check systems are the major methods in use at the present time, and each grower should make it his business to decide which system is most suitable to his particular farm condition, before planting if possible.

If necessary, watering practices should be altered to meet varying seasonal requirements. Obviously an orchard carrying a summer cover crop such as lucerne or millet should be treated differently from a clean-cultivated orchard.

4. Do not cultivate more than necessary and never cultivate too soon after an irrigation. The structure and permeability of the surface soil can be destroyed very quickly by cultivation when the soil is still wet.

5. Humus or organic matter helps to maintain the surface soil in a porous condition, thus assisting in water penetration, and because organic matter is quickly "burnt out" under the hot summer conditions in the north, growers should endeavour to maintain organic matter in the soil at a high level by the judicious use of winter cover crops, and perhaps, summer weed growth.

6. Irrigated annual crops should be grown in a rotation including pasture or lucerne.

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## Journal of Agriculture, Index for 1944

Copies of the Index of the Journal of Agriculture have now been printed, and may be obtained post free, on application to the Stores Branch, Department of Agriculture, Melbourne, C.2.

# IN THE ORCHARD

Contributed by the Horticultural Division

## *Green Manuring*

ORGANIC matter is one of the most valuable components of soils. Farmers praise the crops produced on virgin land. One of the reasons for the satisfactory results obtained on such land, however, is that it has accumulated a store of organic matter from wasted parts of plants which were growing in the soil. Orchardists particularly, value the organic matter in their soils, and because routine practices of cultivation and irrigation cause a loss of this substance, measures to replace it are necessary.

What are the reasons for the high value placed on organic matter, and how can it best be replenished in orchard soils? Associated with organic matter are the minute soil organisms which play a most important part in the supply of plant foods and minerals to the trees. As a result of the activity of these organisms, the nitrogen in the soil is converted into nitrates, the form assimilable by the plants, and various minerals including calcium, phosphorus, potash, iron and magnesium are made available. In addition to acting as a chemical laboratory, organic matter has a beneficial effect on the physical properties of the soil. Heavy soils low in organic matter become difficult to cultivate and irrigate, and these undesirable features are likely to increase. Sandy soils have a tendency to wash or suffer from wind erosion. Regular replacement with some vegetable material will remedy these conditions.

Farmyard manures are in short supply at the present time, so that growing a green manure crop offers the best possibility of achieving this replacement. The crop must be high in nitrogen in order to add to the supply of this fertilizer in the soil. A bulky cereal crop, with low nitrogen content, results in the withdrawal of available nitrogen from the soil when ploughed under. Application of nitrate of soda would overcome this deficiency. Therefore, a leguminous crop such as tick beans, dun peas, or blue lupins should be chosen. It is necessary to plough the crop under when it has made the maximum growth but has not become fibrous. Fibrous, woody plants are slow in breaking down. The best stage occurs when flowering commences.

### Time to Sow.

In order to obtain maximum growth before it is slowed down by cold weather, early planting is essential. If available, irrigation should be used to establish the crop. Seed of tick beans, dun peas, or lupins sown at the rate of 1½ to 2 bushels per acre, together with the available ration of superphosphate, should produce a satisfactory crop. Apple and pear growers may plant alternate rows, and use the alternate rows for carting out the fruit.

## *Codling Moth*

Reports from all apple districts indicate that codling moth has caused considerable damage. Some growers claim that the usual sprays do not appear to be effective this year. It is always noticeable, however, that when the apple crop is light, codling moth is conspicuous and apparently more difficult to control. Last season there was a particularly heavy crop of apples, and unless spraying was efficient the moths could breed in large numbers without seriously reducing the total yield. It would mean, however, that there would be a large population of overwintering grubs. A big spring brood of moths would make control difficult early in the season. Spraying could not be expected to be completely efficient because vigorous leaf growth, which occurs with a light crop, prevents complete spray coverage of the fruit and increases deterioration of the spray coating by "leaf rub." Although there is an explanation for the increased damage, there is no excuse for relaxing control now. The most serious damage in apples can occur from the late broods of moths. Because growers are harvesting fruit at this time of the year, there is a tendency by some to forego spraying, whereas it would be more economical to concentrate some of the available labour on spraying, should a period of moth activity occur. Growers not desiring to build up a deposit of lead arsenate at this time of the year may prefer to use white oil emulsion, strength—1 gallon in 80 of water.

# THE RABBIT PEST

## Various Methods of Control

By E. J. Pemberton,
Superintendent, Vermin and Noxious Weeds,
Department of Lands and Survey

DURING the past year there has been a decided increase in the rabbit population in all parts of the State, except the drought-affected areas. The increase is attributed to several factors, chief of which are shortage of labour, shortage of materials, and scarcity of wire-netting.

Owing to the demands made upon producers for the supply of greater quantities of foodstuffs, all available labour was directed to this work.

Strychnine, phosphorus and fumigating materials have been in short supply, most being imported from abroad, but this disability has now been partly overcome, due to importation by Commonwealth authorities of a large quantity of strychnine, which is now available through the ordinary trading channels.

A large portion of this strychnine is in the form of a brucine-strychnine mixture, which has a strychnine content of 43 per cent. This material has been tested at the Melbourne University and the Veterinary Research Division of the New South Wales Department of Agriculture. Trials were also extended to the Lands Department, Victoria. All of the tests showed that the material was satisfactory for the destruction of rabbits. The usual practice is to use 1 ounce of strychnine to 14 lb. of apples or carrots, but if brucine-strychnine is used the quantities are 1 oz. to 8 lb. The baits should be of good sound fruit or carrots, and cut into cubes not larger than half an inch.

Greatest care should be taken to see that baits, both for "free feed" and poison baits, are sweetened with sugar and that poison baits are not put down until the operator is satisfied that the free feed is being readily taken by the rabbits.

Brucine-strychnine mixture is the most satisfactory substitute for strychnine alkaloid, and where the latter is not procurable this substitute should be used.

Phosphorus preparations in the past were used largely at this period of the year, but under recent fire legislation the use of phosphorus in any form likely to cause a fire has been prohibited. The only substitute now available is white arsenic, which can be used with pollard similarly to phosphorus. A formula has been prepared and is included in this article for guidance of landholders.

Landholders may not hope for a large distribution of wire-netting for rabbit-proof fencing for some time at least. Supplies are short, and existing wire-netting fences which have deteriorated must be made to serve by making temporary repairs to render them rabbit-proof until new netting is available.

The subject of rabbit control must give cause for serious thought and active attention of all owners and occupiers of land throughout the State. The losses caused by rabbits cannot be accurately calculated, but they must amount to many thousands of pounds annually, both from the damage they do and the expense incurred in their control. Apart

from the pastures eaten (one rabbit will eat its own weight in lucerne in one night), the fouling effect of rabbits on soil is considerable. The rabbit takes the sweetest pasture, and also the seeds and roots when the pastures dry off. Consequently, the productive capacity of rabbit-infested properties is greatly decreased.

A proclamation has been issued under the Vermin and Noxious Weeds Act requiring owners and occupiers of land on and after the 7th day of February, 1945, to destroy all vermin on their properties and on the half-width of all adjoining roads. Failure to comply with this proclamation will render offenders liable to prosecution.

The Lands Department wishes to avoid prosecutions, but landholders who comply with the Act must be protected, and it will be necessary to institute proceedings in all cases of neglect. Inspectors throughout the State, therefore, are being instructed to strictly enforce the provisions of the proclamation.

In view of the serious increase in the rabbit population the Lands Department appeals to all landholders to render the fullest co-operation in bringing the menace under control. Inspectors throughout Victoria will be instructed to deal effectively with rabbits on all vacant Crown land, and all Government Departments have been requested to co-operate in the campaign for rabbit destruction.

It is suggested that thorough poisoning work be carried out, and followed by fumigation or digging out of all burrows and other harbouring places. If landholders deal with rabbits now, large numbers of breeding rabbits will be destroyed, pastures and crops will be protected, and farming returns will increase. At the present time when every ounce of foodstuffs is necessary for feeding the fighting forces, the civil population and our Allies, this action is more than ever necessary.

For information and guidance of landholders the following formulas for the destruction of rabbits are supplied.

## *Poisoning*

### Apples and Strychnine.

Cut up the apples into baits about half to five-eighths of an inch square, dust with 1 oz. powdered strychnine to 10 or 12 lb. of apples, say, with a large-sized pepper castor. Sugar in the proportion of about 1 lb. to 15 lb. of apples dusted on the bait is a great additional attraction. This applies moreso when the fruit is a little on the sour side. If the apples are sweet, less sugar is necessary. Lay in a furrow from 6 inches to 3 feet apart according to the infested state of the place. The advisability of "free feeding" *several times* beforehand cannot be too strongly recommended. In fact it is practically essential to success. The baits in "free feeding" should be similar to those which are poisoned and should be laid in the same way. If the baits free from poison are well taken, success is certain. The rabbit comes to the furrow eager and unsuspicious and falls an easy victim.

The *poisoned* baits should be laid from about 18 inches to about 6 feet apart, according to the infested state of the land. One pound of apples should make about 250 to 300 baits, therefore an ounce of strychnine should do from 2,500 to 3,600 baits. The necessary length of the furrow required can thus be readily determined.

In places where there is only a small number of rabbits it is a good plan to peel the apples used in the actual poisoning (not necessarily with the "free baits"), as every side of the bait will then absorb poison

In situations where furrows cannot be readily made, poison can be laid on scratches similar to those made when trapping. When poison is taken the furrow should be replenished until the rabbits cease to take it. It is better to err on the side of liberality than the opposite; far better to have some poison left in the furrows than to have a few rabbits left for future breeding.

Apple poisoning has come to stay, and splendid results are being obtained throughout the State wherever the above directions are properly carried out. The great points in favour of apple poisoning are:—

It is effective all the year round, no matter how plentiful the grass may be.

It is cheap and simple.

The rabbits die near the furrows.

The value of the skins will, in nearly all cases, more than recoup the cost of the work.

If the poisoned baits are put down last thing at night, and looked at early the following morning, there is little danger to stock and bird life and, under any circumstances, if the baits are laid right

in the furrows stock are not likely to get at them.

Young rabbits will take it as freely as old ones.

### Carrots and Strychnine.

Act in exactly the same way as with apples excepting that, as the carrot is a dry bait, it is necessary to soak the baits for awhile in sugar syrup and then drain off and use. Not only is the sugar an additional attraction, but it will also hold and absorb the strychnine.

Good results obtained with apples and strychnine.

The use of apples and carrots is strongly recommended and cannot fail if the directions are followed. The making of the bait square is emphasized for the following reasons:—When the rabbit's suspicious nature (and it has plenty of it) is lulled by the "free feeding", it comes to the poisoned bait keen and eager. The bait being square offers a nice point for a bite no matter from what side the rabbit approaches it. The animal, therefore, is able to get a sizeable piece in its mouth at the first bite. That is all that is required, for there is enough strychnine in that one bite to ensure death. The rabbit does not go away from the furrow, however, but will try other baits, until the poison does its work. That is why rabbits are nearly always found dead along the furrows. Although good results have followed the use of inferior apples, the use of good quality apples is advised for the best results. It is best to be liberal with the "free feeding." While one taste of the poisoned bait is enough, a proportion of the rabbits may eat a number of the "free" baits and thus prevent others from eating and acquiring a liking for them, so that they will take the poisoned baits later. It is advisable to put out six or seven times the quantity of "free feed" as compared with that poisoned. The baits should be clean cut and not bruised. If bruised the baits deteriorate rapidly and are not nearly so attractive to the rabbits.

Another point in favour of the above method is that there is little likelihood of destroying valuable birds, and if the baits are put down towards evening and looked to (if any are left) early in the morning, there is practically none at all.

Experience of field officers has shown that it is rare to find a bird killed by these baits, despite assertion to the contrary.

### Pears and Quinces and Strychnine.

Use in the same way as apples. Although these fruits have been used successfully the apples are preferred, but quinces are good in late autumn.

### Arsenic and Pollard.

Dissolve 2 pints of treacle or honey, or 5 lb. of sugar, in 1 gallon of hot water and thoroughly mix 2 lb. of arsenic, 10 lb. of pollard and 2 lb. of bran in a revolving machine, churn, or in a dish or tub. Mix the arsenic, pollard and bran with the sweetened water, stirring well all the time until the mass comes to the consistency of dough. When the mixture has been well kneaded, it can be distributed with a machine or laid by hand. If laid by hand it is a good plan to place a portion of the dough at a time on a clean board, first dusting the board with dry pollard and kneading it well, then roll it out until it is about one-third of an inch thick. Cut it into cubes with each face about one-third or half an inch square. Gather up the cubes into a box in which there is some dry pollard and lay in furrows a few feet apart.

As with phosphorus preparations stock should not have access to poison trails.

*After using arsenic the hands should be washed with soap and water to which a small quantity of phenyle has been added.*

### Method of Laying Poison.

For any form of poisoning the surface of the ground must be turned over with a plough, a hoe, or some other suitable implement. The rabbit will always come to newly up-turned earth to play or scratch. It is not sufficient to merely chop the grass from the surface. These furrows should be drawn between the feeding grounds and rabbit harbour so that they will be found by the rabbit when it comes out to feed. Newly up-turned earth always attracts the rabbit. In the breeding season, however, it may be wise to run a furrow around burrows or warrens. "Free feed" and poison bait should be fed into furrows. There is a general belief that the proper time for poisoning is during the summer months only, but this is not true. There is no time of the year, wet or dry, that rabbits cannot be induced to take some form of poison. They will always take fruit or carrots. It is mainly a question of intelligent and judicious preparation.

Poisoning operations, however successful, should be followed up by other means of control. There is generally a percentage of vermin left which will quickly breed again, and these should be destroyed by digging out or fumigation. If trapping is done—and the writer cannot recommend this method of control—the traps should be set in the mouths of the burrows so that the breeding does and young ones will be caught, and not on the feeding grounds or "buckheaps" where the marketable rabbits are caught, while the does and young are left in the burrows to keep up the supply. No work is complete unless all burrows are destroyed. If left the residence is always there awaiting tenants, and is certain to find occupants in due course. This action, coupled with the destruction of other harbour—such as log fences, fallen timber and hedges, and the erection of wire-netting will soon rid a property of its rabbits.

## *Fumigation*

Fumigation is undoubtedly a good form of rabbit destruction, especially in sand burrows, old wombat holes, under roots of trees, and in the banks of creeks and rivers. It is useful also in flat country which, at the time of flood, is liable to have running water over it. *The danger of erosion in such places when digging is resorted to is often great,* and can be greatly minimised by the use of the fumigator. It is an infinitely less expensive method than digging out.

As with digging out, a proper system must be employed in starting the work of fumigating any infested area. Men operating the plant must not be allowed to wander indiscriminately, but should begin the work at one end of the area and work right through, being careful to check up the previous day's work before starting each day. Dogs are necesssary to put rabbits under ground, for if loose rabbits are left to harbour in logs, scrub and other hiding places, burrows already fumigated will be easily opened up. In fumigating a burrow care should be taken to dig the mouth of the opening well back to solid ground, and when filled with gas the opening should be properly sealed. In sandy country it is a good plan to heap the filling in mounds. Where air pockets form in the burrows, it may be possible for a rabbit to escape the gas fumes. It will work its way to the mouth of the burrow and will have to scratch this filling away. In doing so the gas is agitated with deadly effects upon the rabbits. It is often found in examining burrows that one or more rabbits are found dead in the mouth of the burrow. Proper filling of burrows will often prevent opening from outside.

Several methods of fumigation are practised, namely carbon monoxide gas, bisulphide of carbon gas, and cyanogas (calcium cyanide).

### The Carbon Monoxide Method.

Machines are available which produce carbon monoxide gas (C.O.), which no rabbit can survive for 30 seconds. Wood and water only are required in the production of this gas. A fire is lit in the generator, and when a substantial bed of compact charcoal has been formed, the engine or hand-blower is operated. This action forces the ordinary atmosphere through the burning mass of charcoal, which eliminates oxygen, leaving a mixture of nitrogen and carbon monoxide. This mixture passes over the water and is forced into the hose and introduced into the warren to be treated. The gas is generated quickly in large quantities and will be seen issuing from other inlets to the warren. These entrances should be closed with earth. There is no danger to the operator from this C.O. gas, as it breaks up immediately it makes contact with the open air.

### Bisulphide of Carbon.

Bisulphide of carbon is a highly inflammable liquid, and care must be exercised in its use. Men using this method must not smoke or allow bisulphide of carbon to come in contact with fire. A foolish practice has grown up by some men firing this gas. This is very dangerous and unnecessary; actually, firing destroys the effects of the gas, and must be discouraged. The approved method of using bisulphide of carbon is with a "Suddeth Fumigator" using a smoke mixture composed of liquid ammonia and hydrochloric acid. "Suddeth" machines are provided for (*a*) carbon, (*b*) ammonia and hydrochloric acid, and are provided with taps enabling each mixture to be released as required. The main opening of the warren is selected for treating. This opening is dug back to solid ground and the outlet hose is inserted well into the burrow. The opening is properly sealed to prevent back flow of gas. Ammonia and hydrochloric acid is now pumped into the warren. This mixture forms a smoke which will emerge from any connected openings of the warren. Each opening is then sealed until no further smoke is seen. The smoke mixture tap is then turned off and the carbon tap turned on, and this material is then pumped until the burrow or warren is full of gas. When this is done the hose connection should be withdrawn and the opening properly sealed. All burrows and warrens are treated similarly.

If a "Suddeth" machine is not available, bisulphide of carbon can be used by pouring a small quantity on to any absorbent material, such as bagging, wool or dry cow dung. With this method each opening of the warren must be treated by inserting a piece of the treated material well into the opening of the burrow which has been dug back to solid ground. When treated, each opening is properly sealed. This method is wasteful, however, and not recommended.

### Cyanogas (Calcium Cyanide).

Calcium cyanide is available in powder, flake, and granulated form.

*Powder Cyanogas.*—Burrows or warrens to be fumigated with cyanogas should be prepared as with other methods. Choose the main opening, dig back to solid ground and insert the outlet hose into burrow or warren; if possible choose an opening in the direction the wind is blowing. Do not close the opening. Begin pumping alternately with gas cut off. First set machine in the "On" and then the "Off" position, close all openings from which dust is seen to emerge and continue blowing until all connected openings in the warren have been located and closed. Now close the opening around the hose and continue pumping dust into the warren for a few minutes; withdraw hose and properly seal the opening.

*Flake Cyanogas.*—This material is used when a blower is not available. Each opening is dug back to solid ground and treated by using a long-handled ladle or spoon into which one ounce of flake cyanogas has been placed. This is then inserted full length into the burrow, poured out, and the ladle or spoon withdrawn and the burrow properly sealed. Cyanogas in powder form must only be used when blower is available.

An effective type of fumigator.

Cyanogas quickly disintegrates when in contact with the atmosphere, and being lighter than air the gas rises quickly and, if carelessly handled, may be inhaled by the operator with ill effects. The user may with extreme carelessness be asxphyxiated. With the use of flake cyanogas, however, this disintegration is not so rapid and the danger of hand using is not so great. Where any effects are noticed the antidote is liquid ammonia, which should be used as with smelling salts.

## *Digging Out*

While digging out appears to be a simple matter, apparently requiring no great skill, yet there are several points that may be emphasized. There is no doubt that digging out is an effective method of dealing with rabbits where it can be carried out, but at the

same time it is one of the easiest jobs to slum by careless workmen. It is easy to miss little runs or side burrows. If, on inspection of the filled-in burrows the next day, any clean cut holes with the soil scratched backwards is found, it will be realized that rabbits are being missed. No burrows or warrens should be left partly finished overnight. If so, nearly all the rabbits—except perhaps the little ones—will leave the burrow before next day. Any one who has had a perfectly secure wire-netting paddock dug out knows that the biggest catches are made in the last day or two. When a paddock is not netted, a good plan is to do a day's digging on, say, the north-east corner, the next day the south-east corner, and then the other corners and so on, putting in several days before coming back to the starting point. The rabbit is so suspicious that many will desert the burrows next to where the overnight work has been finished, but they will drift back again to those burrows when they find things are quiet again. By using this method all round a paddock and finally finishing with the central burrows, the best of results will be obtained. Even if the occupiers of these burrows are unsettled, they are less likely to leave because all the burrows round them have been disturbed and do not offer much harbour. This principle has been followed with much success. If a property is bad with rabbits, burrows and harbours, a good poisoning is recommended, to be followed by other means.

Burrows should not be left open after digging out, but should be levelled off, and if the time of the year suits, sown with grasses. This will destroy all signs of burrows, and any rabbits that may come later are unlikely to make fresh burrows in these places.

Good practical workers can fill in the greater portion of the burrows behind them as they go along, leaving little to do at the finish. On the other hand, if the open trenches and dirt heaps are left, a direct invitation is given to the rabbit to make a fresh start.

# Soil Survey Report—
# Shepparton Irrigation District

A BULLETIN describing a soil survey of part of the Shepparton irrigation district has been prepared by the Department of Agriculture, and is now available free of cost. The survey was conducted by officers of the Soils Section of the State Laboratories, following abnormal losses of peach and apricot trees in 1939. It was designed to classify and map the soils of the district, and relate tree losses with soil type and to supply information on which measures could be taken to prevent similar losses in the future.

Attention was given to other factors involved in the loss of trees, such as local topographical features, irrigation methods, drainage facilities, soil salinity and occurrences of subsoil water. The survey also provides a basis for the best use of the various soil types and will thus help in the further development of the district.

"Drifts" or underground water courses have long been suspected in the district and special steps were taken to locate and trace the whole pattern of the more important drifts and to determine their effects on horticulture. Contrary to local opinion, it was found that these drifts did not bring water into the area from outside.

In addition to supplying soil maps, the bulletin describes the various soil types and their chemical and physical characteristics. It discusses the water properties of these soils, the relation of drifts to the occurrence of the subsoil water, and the horticultural situation in relation to soil type, irrigation and drainage.

The bulletin is of 73 pages, with four large, detailed soil maps, and a copy should be in the possession of every block holder in the area. Copies may be obtained from the Shepparton office of the State Rivers and Water Supply Commission, or from the Department of Agriculture, Melbourne, C.2. Owing to wartime restrictions the soil maps in the bulletin are uncoloured, but coloured copies can be inspected at the Water Commission's office. Any inquiries regarding the application of the results of the survey to an individual block will be answered on request to the Agricultural Research Chemist, Department of Agriculture, Melbourne.

# The Flower Garden

By J. L. PROVAN, B.Agr.Sc.,
Principal School of Horticulture, Burnley Gardens

THE main work in the flower garden this month is watering, mulching, hoeing and tying-up. Probably the best results from watering are obtained when water is applied in a fine, misty spray which falls gently over the plant and soaks slowly into the soil for a period of from half an hour to one hour.

Such watering is suitable for the majority of plants, but not the large-flowered marigold and similar plants where the weight of water breaks the flower stems, and where plants are suffering from attacks of mildew of the foliage or other fungous diseases which thrive in wet, warm conditions.

If the foliage of the plants dries quickly after watering, no fungous infection is likely to occur. Undoubtedly, the best time to water is in the early morning. The water pressure is much better then, and the leaves dry quickly. If you desire to learn something about the penetration of the water into the soil dig a hole about 18 inches deep with your spade about ten or twelve hours after the sprinkler has been turned off. Many gardeners will be surprised by the observations that can be made. So frequently, where watering has been insufficient, the surface soil is wet, but the sub-surface soil is dry and hard. The misty spraying of the foliage will also discourage pests, such as the red spider, which thrives on the undersides of the leaves during dry, hot weather.

### *Mulching and Hoeing*

The term "mulching" may mean several things to a gardener. Most frequently it means a layer of stable manure spread over the surface of the soil to a depth of 2 or 3 inches. The stable manure may be either fresh or well-decomposed, or at some intermediate stage. To increase the bulk the manure may be mixed with lawn clippings, leaves, or weeds and other garden rubbish, or with compost from the compost heap. If stable manure is unavailable the weeds may be left on the beds after hoeing, and also additions may be made from the compost heap. These types of mulching, as well as providing varying amounts of plant food and maintaining the organic matter or humus content of the soil, also assist in keeping the surface soil moist and cool and encourage root growth.

Another form of mulch is called a "dust mulch." This is maintained by frequent hoeings of the surface soil to a depth of 1 to 2 inches. This "clean cultivation," as it is sometimes called, must be supplemented by generous additions of organic matter to the soil when the beds are dug in winter, otherwise soil fertility declines rapidly. When this decline occurs, one of the apparent symptoms is the loss of the crumb-like texture of the soil. The surface soil becomes dusty when dry and sets hard after watering with a crust on the surface. Sometimes, as in the heavier soils, when cultivated, large, hard clods are formed.

The stable manure, or the compost mulch, gradually decays during the summer and autumn, and is in a desirable condition to incorporate into the soil during the winter-digging operation. Either of these types of mulching is suitable for dahlias, flowering annuals and perennials.

### *Tying-up*

Dahlias require constant attention this month. If the first main growths have been securely tied to the stakes during December and January the lateral growths arising in the axils of the leaves will be fairly well supported and the plant will not become loose in the soil. But as these lateral growths become longer and flower-buds appear, they tend to become top-heavy and may break away from the stem. A loose tie around these laterals will give them

the support they need. Do not tie them tightly in a dense bunch, otherwise the foliage becomes too massed and insufficient light will reach the crowded parts of the plant.

Zinnias, African marigolds, delphiniums, helenium, rudbeckia, and many other tall plants will require staking and tying up.

### *The Silver Tree*

No doubt, many gardeners know this fine tree, which grows in some of our suburban gardens. It has the reputation of being difficult to grow because some specimens, after growing well for a few years, suddenly collapse and die for no apparent reason. One of the best specimens of this evergreen the writer has seen is growing in Rochester-road, Canterbury. This specimen is from 20 to 25 feet in height, and is growing on a hillside facing the east. The tree is particularly noted for its long, soft, silvery leaves which are closely set along the stems. When stirred by a gentle wind the silvery effect of the foliage is most attractive. The botanical name of this Silver Tree is *Leucadendron argenteum,* and in its native home—South Africa—it grows to a height of about 15 feet. It belongs to the same family as the Protea, but the Silver Tree is the only member of the genus Leucadendron which reaches tree proportions; all the other members are shrubs, or small prostrate plants. The tree requires a sunny, open position and a well-drained soil. The reason why so many of these trees fail in Melbourne gardens appears to be that the soil is too wet in winter and spring. They enjoy a dry soil in winter, and only a moderate amount of water in the summer. Seed is seldom seen on specimens of this tree, because the male and the female flowers are borne on separate trees, and unless one of each kind is grown in close proximity no seed is produced on the female tree. To propagate the Silver Tree, seed is usually imported from South Africa, or it is raised from cuttings.

# The Vegetable Garden

### *Cabbage, Cauliflower, and Brussels Sprout*

Prepare beds early this month for transplanting seedlings of cabbage and cauliflower. Both these crops require a rich soil and prefer clay loams and loams to the light sandy soils. Dig in large amounts of well-decayed manure or compost, and add 3 oz. of blood and bone or market garden manure to the square yard. After a good soaking with water to consolidate the soil, seedlings may be planted out. Varieties of cabbage which are suitable for transplanting this month are *Drumhead, Early Allhead,* and *Enkhuizen Glory. Early Eclipse* cauliflower may also be planted, as well as *Fillbasket* and *Covent Garden* varieties of Brussels sprout. Success with these crops depends mainly on getting the plants well established and growing strongly during the warm autumn days. Allow ample space for each plant. Rows should be at least 2 ft. 6 in. apart, with 2 to 2 ft. 6 in. between the plants.

### *Spinach*

Sow seed of *Prickly Seeded* spinach in drills about 18 inches apart and cover the seed to a depth of about half an inch. A little well-decayed and sieved manure spread along the drill after the seed is covered will retain the moisture in the surface soil and assist germination.

### *Silver Beet*

Sow seed of *Fordhook Giant, Lucullus* or *Dark Green Broad-ribbed,* thinly in drills 2 feet apart, and cover with a sandy soil to a depth of 1 inch. When large enough, thin out plants to about 1 foot apart.

### *Lettuce*

Seed of varieties such as *Imperial 847, All-Year Round,* and *American Summer* lettuce can be sown in drills about 15 inches apart and covered to a depth of half an inch. Thin later to about 1 foot apart. Provide some temporary shade over the seed drills by means of light prunings from shrubs or trees until seed germinates.

### *Onion*

Sow seed of the early white varieties of onions in seed-beds or seed-boxes. *Silver Skin, Early Barletta,* and *Australian White Queen* are suitable varieties.

*White Lisbon* is a suitable variety to sow for spring onions. These are sown where they are to remain, preferably by broadcasting thinly in a well prepared seed-bed.

### *Red Beet*

Sow seed of *Detroit Dark Red, Derwent Globe,* or *Crimson Globe* in drills in the permanent bed. Space drills about 18 inches apart and cover to a depth of about ¾ inch.

# A "False" Browning Reaction to Rust (Melampsora Lini) Infection in Flax

By C. R. MILLIKAN, M.Agr.Sc., Plant Pathologist, Biological Branch

A BROWNING which has occurred in flax crops in Victoria is different to the typical browning disease associated with *Polyspora lini*, hence it is called "false" browning. This name has been applied for some time to a disease of flax in New Zealand. Specimens of the Victorian disease were submitted to Mr. R. M. Brien, of the Department of Scientific and Industrial Research, New Zealand, who advised that it was similar to the New Zealand "false" browning.

In Victoria, the disease has occurred in a severe form in the Strathkellar and Koo-wee-rup districts where, however, the number of crops showing a high percentage of affected plants has been small. Milder cases of "false" browning have been noted in other districts. "False" browning was first brought under notice early in November, 1942, at Strathkellar, and again, in the following two years, it was reported during the first week in November.

There appeared to be no relation between time of sowing and subsequent development of browning in five crops investigated at Strathkellar—one was sown early, one medium early, two normal and one late.

### *Symptoms*

The disease has first appeared in well-grown crops (up to 30 to 40 inches or more in height) about the beginning of November, shortly before the plants began to ripen off. Crops of both the Concurrent and Liral Crown varieties have been affected in Victoria.

Affected patches scattered through the crop may be only a few square yards in area, or a considerable portion of the crop. The disease develops within a few days simultaneously over the whole of the affected patch, and does not subsequently spread to neighbouring unaffected plants. Diseased plants in the mass show a brick-red colour which is not typical of the colour in the mass of plants affected with

Fig. 1—"False" browning disease of flax.

"browning" disease caused by *Polyspora lini* (Baylis, 1941). Dr. Muskett, of Northern Ireland, in a communication to the writer has described this colour as "dark-brown, and the crop appears as if it had been swept by a flame and scorched." Similarly, the mass of plants infected with *Polyspora lini* in the outbreak at Glen Innes, New South Wales, in 1940 (Anon., 1941) was stated by Mr. W. Poggendorff in a communication to the writer to be "entirely an ashy brown colour, and dried to a dull brown-grey colour."

"False" browning lesions are usually confined to the upper half of affected plants. On the stems they consist of elongated reddish-brown discolourations which may be anything from a few millimetres upwards in length

Fig. 2—Enlarged views of flax stems showing "false" browning lesions and associated abortive rust pustules. The lesions are uniformly reddish-brown in colour.

(Figs. 1 and 2). Usually individual lesions coalesce, with the result that the whole of the upper portion of the stem is affected. The border of the lesion is not obviously darker than the remainder, which fact serves to further distinguish this disease from *Polyspora* browning, in which the lesions are typically grey-brown in colour in the centre with a darkened border (Baylis, 1941).

"False" browning lesions also occur on the leaves (Fig. 3) where, however, they are darker in colour than on the stems. Where a relatively large area is affected, the leaf becomes very twisted and later often drops off the plant. In many crops leaf lesions were the only manifestation of the disease. Often in such mild cases, no obvious discolouration of affected plants in the mass could be detected. It is typical of the "false" browning condition that the lesions on both stems and leaves occur around rust (*Melampsora lini*) pustules which appear abortive (Fig. 3). These pustules are white in colour, due apparently to a complete absence of uredospores. Development of the pustule ceases and teleutospores are not produced later.

Plants in the browned areas of affected crops all showed signs of very heavy rust infection with such immature, aborted uredospore pustules on leaves and stems (Fig. 10), whereas neighbouring plants not showing "false" browning were usually free of rust, or the pustules present were in an advanced stage of "firing" or teleutospore production. As indicated later, however, such pustules are usually abortive. They show a white centre but little surrounding browning. Plants badly affected with "false" browning produce little or no seed, but the effect of the disease on fibre yield and quality is at present not known.

### *Etiology of the Disease*

Considerable work has been done to establish the cause of "false" browning. In the first instance, many attempts were made to isolate an organism from diseased material either plated on to potato dextrose agar or kept in a moist atmosphere and incubated. In no instance was *Polyspora lini* isolated.

Samples of the lines of seed used to sow the affected crops in the Strathkellar district in 1943 were available, and these were examined for seed-borne parasites by the method described by Muskett and Malone (1941). These examinations were also all negative for *P. lini*. As Lafferty (1921) has shown that *P. lini* may be readily isolated from diseased material by the above methods, the negative results obtained strongly indicated that some cause other than the presence of *P. lini* was responsible for the disease.

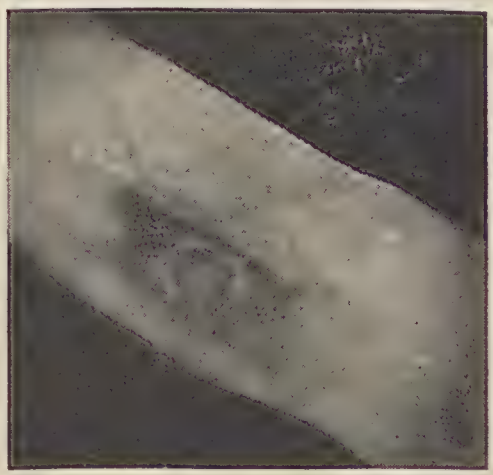

Fig. 3—Flax leaf showing "false" browning around an abortive rust pustule.

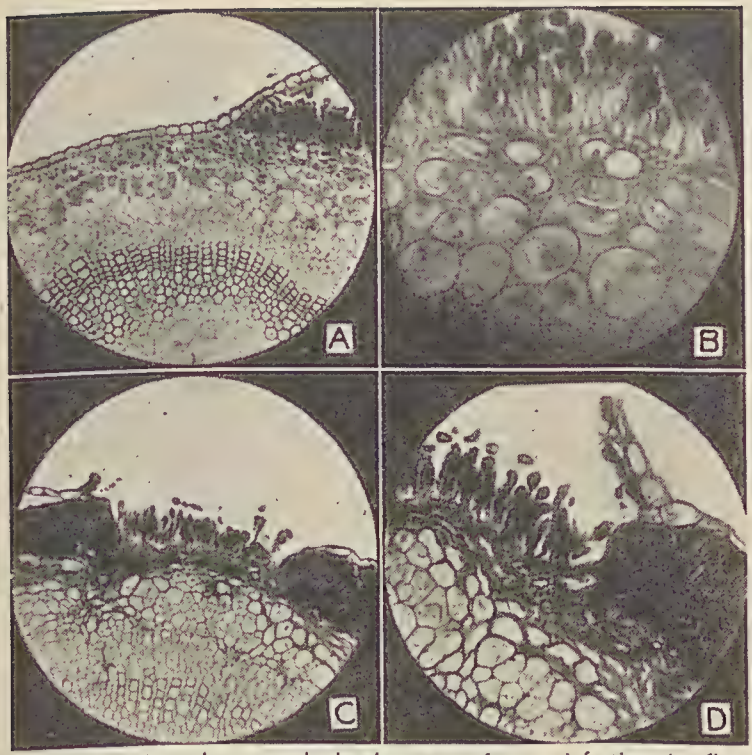


Fig. 4—Showing the normal development of rust infection in flax stems.

### Effects of High Temperatures on Rust Infection.

It is known that the rust fungus (*Melampsora lini*) comprises numerous physiologic forms.

Flor (1935) distinguished fourteen such forms of *M. lini* by their reactions on certain differential varieties. It was found that the types of rust infection varied greatly both with the variety and the different strains involved.

Environmental conditions such as light intensity, length of day, temperature, and age and vigour of the host plant were also found to affect the types of infection exhibited by a variety. Resistance may be manifested by necrosis of the affected area associated with a more or less arrested pustule formation. In particular varieties, infection with certain strains of rust under sub-optimum conditions resulted in premature drying of uredia and the development of necrosis.

It is known that the rust fungus is very sensitive to wide changes in temperature. Dillman (1942) has stated that the spread of *M. lini* is liable to be arrested by a spell of dry weather with daily temperatures of 85°F. Similarly, in Victoria the spread of the fungus is arrested during the summer months. Frosts also arrest the uredospore stage of the disease, although the teleutospores readily overwinter (Henry, 1926). Waterhouse and Watson (1944) have recorded six races of rust from Victoria. At Strathkellar, in 1942, races A and E were present. From their preliminary tests it was apparent that uredospores of race A were tolerant of a considerably higher temperature than those of other flax-attacking races, and would also survive for longer periods at low storage temperatures.

A browning reaction to stem rust (*Puccinia graminis tritici*) infection in wheat has been described by Hart and Allison (1943). A deep brown discolouration, associated with a reduced rust sporulation, occurred about the rust infection centres. They found that this browning was associated with certain resistant and susceptible wheat varieties infected with particular races of rust at temperatures above 28·5°C. The degree of pigmentation varied directly with the length of time the temperature remained above 28·5°C. A brief exposure of infected seedlings was sufficient to initiate the reaction which became evident to the eye within a few days of the exposure. A high relative humidity was found to enhance the effects of high temperature. The greatest reaction was obtained during the incubation period before the pustule was formed. After pustule formation was complete the browning reaction was not so marked unless prolonged high temperatures were experienced.

A study of meteorological records from the Strathkellar and Koo-wee-rup district in Victoria have shown that towards the end of October in each season, approximately one week before "false" browning was first noticed in the field there occurred a day on which a shade temperature of approximately 80 to 85°F. was recorded. The solar temperatures corresponding to such readings would be considerably higher. It was evident that these high temperatures occurred during an early stage in

the development of a very heavy rust infection in the particular plants which subsequently developed "false" browning.

In view of the apparent similarity between "false" browning of flax and the browning reaction to stem rust of wheat described above, experiments were made to determine the effects of high temperatures on flax infected with rust (*Melampsora lini*).

*Method.*—The plants selected were of either the Liral Crown or Concurrent varieties growing in the field and showing numerous uredospore pustules on leaves and stems. The races of rust involved were not determined. The plants were well grown (24 inches or more in height) having at least reached the flowering stage. Selected plants were transplanted to pots and were later transferred to a chamber maintained at a constant temperature of 37°C. and a relative humidity of approximately 85–90 per cent. It was considered that a temperature of 37°C. (approximately 100°F.) would be considerably less than the solar temperature corresponding to shade temperatures of over 80°F., such as were recorded in the field prior to the development of "false" browning in each season. Records from the Waite Institute (Anon., 1942) show that a shade temperature of 80°F. corresponds with a solar temperature of approximately 120°–140°F. (Anon., 1942).

Plants were left in the chamber for periods ranging from six hours to 30 hours. After the heat treatment the pots were placed in the open where maximum shade temperatures of approximately 70°–75°F. occurred, and the subsequent development of symptoms observed. Many plants from crops growing in different parts of Victoria were subjected to this treatment.

*Results.*—The heat treatment had no observable effects on the uninfected tissues of the plants. Striking changes occurred, however, in the infected tissues. Within 24 hours of removal from the chamber, the uredospore pustules began to change in colour from a normal orange to a dull, dark-reddish colour. At the same time the first signs of the development of browning occurred around the edges of the pustule. Two days later many of the pustules had apparently lost most of their uredospores and appeared white in colour. Within this period the browning of the host tissue around the pustule had also become conspicuous. On the stems the colour was reddish-brown, while on the leaves it was somewhat darker. The reaction appeared more rapidly on the leaves than on the stems.

The individual lesions were identical in appearance with those of naturally appearing "false" browning. Leaves with numerous pustules and a relatively large area involved in the browning developed twisting as in the field (see Fig. 1). Within a fortnight most of these browned and twisted leaves had fallen off the plant.

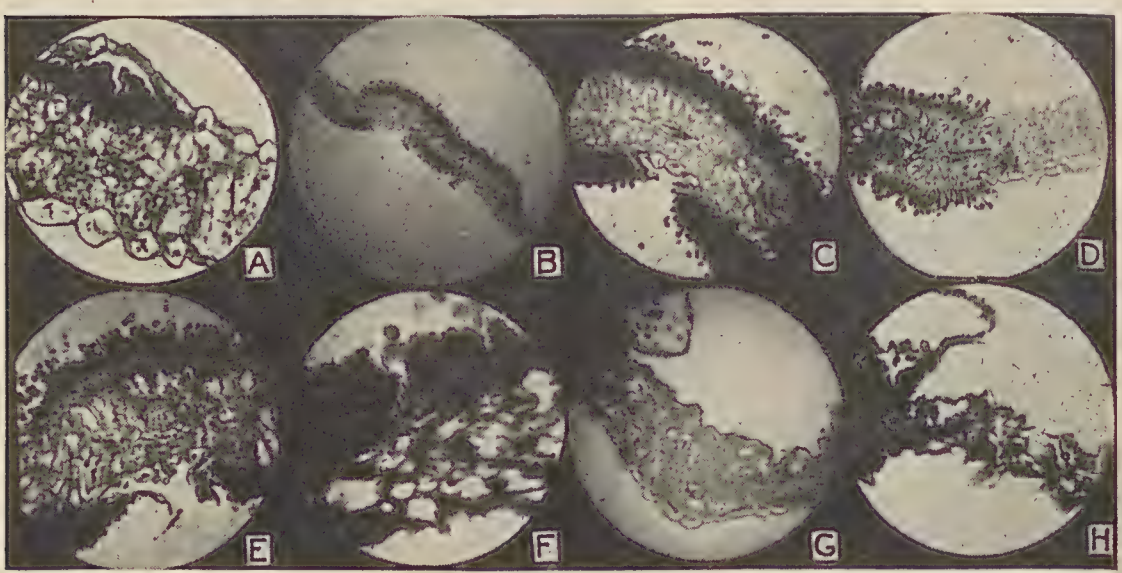


Fig. 5—Rust-infected leaf tissues. A to D normal; E to H "heated" tissues showing stage in the development of the necrosis associated with "false" browning.

The "false" browning reaction appeared to be most marked around very immature uredospore pustules, particularly those showing a wide "halo" of slightly chlorotic tissue around the pustule. It was this area which was affected by the browning. "False" browning developed most vigorously on plants subjected to the longer exposures to high temperatures. The reaction occurred equally freely on plants of either the Liral Crown or Concurrent varieties.

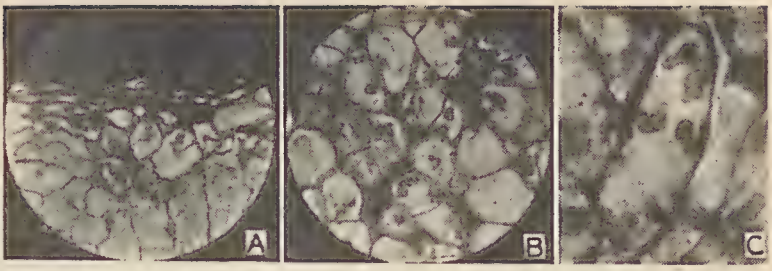

Fig. 6—Haustoria of the rust fungus in the cells of "heated" flax stem (A and B) and leaf (C) tissue.

Several weeks after the heat treatment the aborted uredospore pustules were still white in colour, and had shown no signs of teleutospore formation, although these had developed freely on both the leaves and stems of untreated control plants during the same period.

The more mature the teleutospore pustule at the time of the heat treatment, the less widespread was the browning around the pustule. This was similar to the results of Hart and Allison (1943) with wheat stem rust. In all cases, however, the uredospores remaining inside the teleutospore area became abortive, and no further teleutospore development occurred. This result probably explains the absence in the field of any marked "false" browning reaction around maturing rust pustules at the end of the season when much hot weather is experienced. By this time teleutospore production is usually well advanced. It is common in the field, however, to find aborted teleutospore pustules showing little "false" browning, but with a white centre indicating an arrested replacement of the uredospore area by teleutospores. During the cooler periods of the year the uredospore area is always completely replaced by teleutospores. When such teleutospore pustules are abundant on the plant this produces the condition known as "firing," which of course is quite distinct from "false" browning, although the terms have at times been confused.

### *Histological Studies*

As the association of "false" browning lesions with apparently abortive rust pustules appeared to indicate greater host resistance to the fungus at higher temperatures, some histological work was undertaken to examine the relationship in further detail. This work was performed on normal rust infected tissue, "heated" rust infected tissue, and natural "false" browning lesions respectively.

*Method.*—The normal and "false" browning material respectively was collected from field-grown crops. "Heated" rust infected material was obtained from plants concerned in the experiments reported above. Specimens of

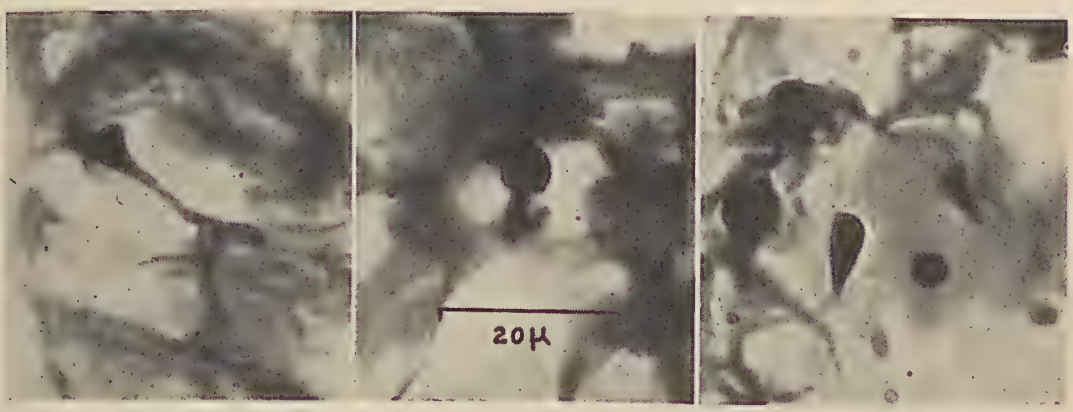

Fig. 7—Miniature spore-like bodies occurring in "heated" flax leaf tissue showing "false" browning.

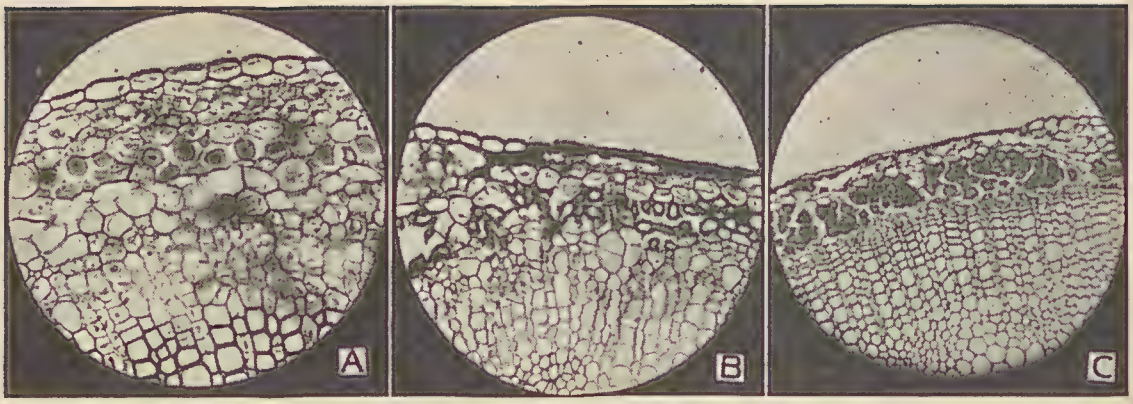


Fig. 8—Sections of rust-infected flax stems. A. normal, B. "heated", C. natural "false" browning. Note the collapse of the invaded cells associated with the development of "false" browning in B and C.

"heated" rust infected tissue were taken at successive periods from a few hours to seven weeks after the heat treatment, so that the development of browning could be studied. The variety in every instance was Liral Crown.

Selected portions of stems or leaves were fixed in formalin-acetic-alcohol, dehydrated through alcohols, cleared in Xylol or chloroform, and infiltrated with and embedded in paraffin containing 1 per cent. of microcrystalline paraffin wax. Sections were cut with a microtome set at 10 to 14 $\mu$, and were fixed to the slides with Haupt's adhesive. Various staining combinations were tried, notably iron-alum haematoxylin, Fleming's triple stain, Pianese III. B stain (Conn, 1940), Margolena's Quadruple combination (Margolena, 1932), Johansen's Quadruple stain and Connant's Quadruple stain (Johansen, 1940). Excellent differentiation was obtained with each of the three last-named combinations.

However, for routine examinations, Connant's Quadruple stain was used. After staining, sections were mounted in balsam for examination.

*Results.*—The results of the histological studies may be summarized as follows:—

(*a*) *Normal Rust Infected Tissue.*—With the Connant's combination, uredospores, teleutospores and basidia stain reddish-purple. The bases of the basidia, however, do not stain (see Fig. 5c). The mycelium under the pustule never stains red (generally slightly purple) although the extending mycelium may stain slightly red. Under teleutospore pustules the mycelium stains purple. The staining of the haustoria is described below. It is obvious, therefore, that a considerable difference exists in the chemical composition of different parts of the fungus as indicated by their staining reactions.

Rust hyphae in both leaves and stems may extend for considerable distances from the individual immature uredospore pustules (Figs. 4A and 8A). The tips of this hyphae are never swollen to form sporelike bodies in a manner comparable to that in "heated" tissues described below. The area occupied by the extending mycelium is usually seen macroscopically as a "halo" of slightly chlorotic tissue surrounding the uredospore pustule. It would appear that, when the pustule is mature, the teleutospores fully occupy the area above the hyphae.

In the stems the extending hyphae is confined to the cells between the fibre layer and the epidermis. The cells of the epidermis itself are never collapsed (Figs. 4A and 8A). In the region of the pustule these cells ultimately collapse down to the fibre layer (Figs. 4C and D) and the cells on the inner side of this layer also become invaded. Hyphae were detected between the individual fibre cells. At this stage the lumen of the fibre cells below the pustule may stain red when using the Connant's combination (see Fig. 10B). This does not occur in normal fibre cells. It seems probable, therefore, that at this stage some injury to the fibre cells had occurred.

In the leaf the extending mycelium may stain slightly red. This mycelium occurs among cells which may otherwise appear normal (Fig. 5A); plastids often occur in the area and show no disintegration, and the spongy mesophyll shows no collapse. The hyphae penetrates from the point of infection to the opposite side of the leaf where uredospores are also produced (Fig. 5B).

In both stems and leaves teleutospore production commences around the outside of the pustule and finally completely replaces the uredospores. Until such replacement takes place, however, uredospores are always present in considerable numbers inside the teleutospore area (Figs. 4c and D). In this regard normal pustules differed markedly from "heated" pustules, and also from pustules in "false" browning lesions.

Immediately under the uredospore pustules the haustoria are usually so numerous as to completely fill the cell (Fig. 4A and B, 5D). The contents of such cells usually have a somewhat granular appearance and are only slightly stained, the colour being a greenish purple. Where only one or two haustoria occur in cells under both uredospores and teleutospores and in tissues remote from the pustule, they normally stain green.

However, as the teleutospore pustule ages and the underlying cells collapse some of the haustoria stain red (Fig. 6). In naturally occurring pustules in which uredospore production had been arrested due to frost both red and green staining haustoria also occurred under the same pustule. In these cases the haustoria in the cells on the edge of the pustule stained green and accumulations of hyphae which often occurred, indicated the continued activity of the fungus and the beginnings of teleutospore production.

It would appear, therefore, that the staining reaction of the haustorium is an indication either of its age or its vigour.

(*b*) *"Heated" Rust Infected Tissue.*—The area affected by the artificially produced "false" browning was seen to be the same as that occupied by the rust hyphae. Within 40 hours after the heat treatment marked changes had occurred in the leaf tissues. The bases of the basidia stained red as did the remote hyphae (Figs. 5E and F). However, the hyphae immediately below the pustule was still largely unstained or slightly purplish in colour. The pustules had apparently not yet lost any uredospores, although at the time of this sampling the macroscopic appearance of the spores had changed from the normal bright orange colour to a dull dark-red.

A striking change was apparent in the remote hyphae. They were thickened and their tips showed marked swellings, which were usually spherical or ovoid in shape and resembled very undersized uredospores or teleutospores. These spore-like structures stained deep reddish-purple, similar to the normal uredospores and teleutospores (Fig. 7). Hart and Allison (1943) have described similar spore-like bodies in the browned tissues of wheat leaves, and a whole or partial ensheathment of the haustoria, resulting from the effects of high temperatures on stem rust infection. There was also a tendency towards spore-like encystment of germ tubes when uredospores of race 34 of *P. graminis tritici* germinated at high temperatures.

Many red staining haustoria also occurred in the "heated" leaf tissues at this stage. They appeared to be thickened particularly at the base (Fig. 6c). These changes in the fungus were accompanied by changes in the host tissue. The cell contents, particularly in the infected tissues remote from the pustule, had commenced to disintegrate, which change was followed by a collapse of the cell walls,

Fig. 9—"False" browning reaction in "heated" rust infected tissue. Note the necrosis of invaded cells in the browned area (A and B) and the aborted uredospore pustules (B and C). Compare Figs 4 and 10.

with the result that the thickness of the leaf decreased considerably. The disintegration of the chloroplasts is doubtless the principal factor producing the initial loss in green colour in the affected area. However, a general necrosis soon follows (Figs. 5E to H).

Within 60 hours of the termination of the heat treatment the necrosis of the tissues had become almost complete. The necrotic areas stained readily with Saffranin O, even directly under the pustule. This was in marked contrast to the staining reaction of normal rust infected leaf tissue when using Connant's stain (of Figs. 5C and 5F).

Similar sections stained with Johansen's and Margolena's combinations respectively showed dense accumulations of hyphae in the necrotic areas (these stained green with Johansen's and blue with Margolena's stains respectively). It was evident, therefore, that it was this hyphae which had developed an affinity for the Saffranin O in Connant's schedule. However, with Johansen's combination, red staining areas, suggesting suberized deposits, occurred in the green staining necrotic tissue. For this reason, hand sections of fresh material of both leaves and stems were stained in Sudan III. In these tests the necrotic areas did not take up the stain, indicating that no suberization had occurred.

Thirteen days after the heat treatment the uredospore pustules had lost most of their spores, even where there was no sign of the commencement of teleutospore production, or of the development of a secondary pustule on the opposite side of the leaf from the original pustule (Fig. 5F). From the description of the course of normal rust development in infected leaf tissue as given above, it will be seen that this was an entirely abnormal condition.

Sections of artificially produced "false" browning lesions on stems showed that changes, similar to those described above for the leaves, had occurred. The browned area stained readily with Saffranin O, as did the bases of the basidia in the uredospore pustules. The basidia themselves often showed a banded type of staining. The "false" browning reaction was seen to be associated with a necrosis and collapse of the cortical cells usually down to the fibre layer under the pustule (even in the case of very small uredospore pustules), and to a lesser degree in the region of the extending mycelium, depending upon the amount of invasion of the cells in this region (Figs. 8 and 9). At the outside edge of the browned region the cells of the epidermis only may be collapsed, and their contents stain red.

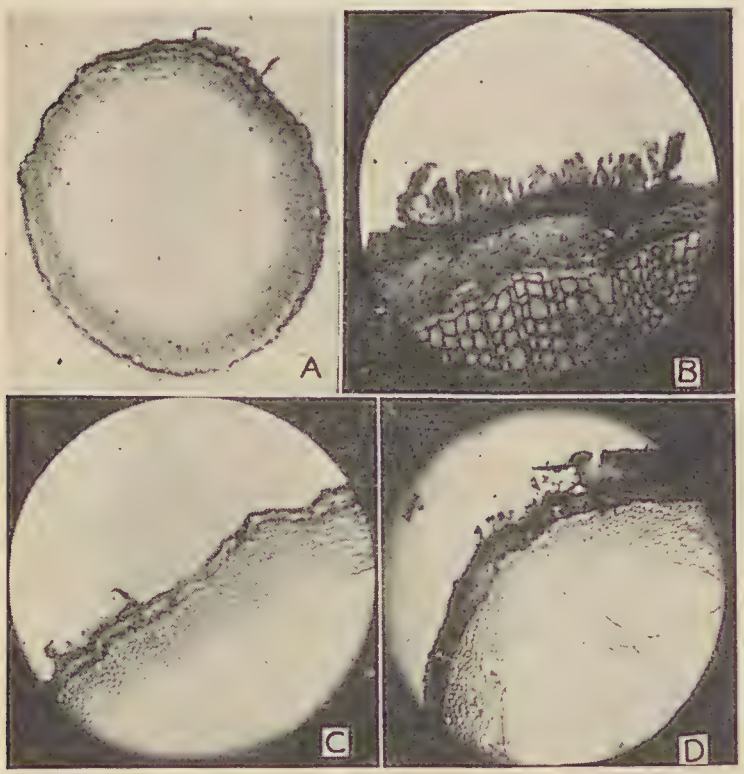


Fig. 10—Section of naturally-occurring "false" browning lesions on flax stems showing the association with aborted rust pustules.

Striking changes occurred in the haustoria. Instead of the normal green staining, many were red (Fig. 6), and others occurred in which portion stained red and the remainder green. The greater the time after the heat treatment the greater was the proportion of red staining haustoria that occurred. Differences in the staining reaction of haustoria in normal and heated infected tissues were also detected by the use of either Johansen's or Margolena's quadruple stains.

In stem specimens selected seven weeks after the heat treatment the pustules were seen to be

abortive, as they contained no uredospores; these were often replaced by saprophytic fungi (Fig. 9c.) Teleutospore formation had also ceased.

No miniature spore-like bodies have been detected in "heated" infected stem tissues.

The reaction to high temperature described above is apparently much more severe in its effects on the host tissues than is Hart and Allison's browning reaction. It appears to correspond with the more severe type of browning associated with *Puccinia graminis tritici* race 21 at high light intensities and high temperatures, described by Hart and Zaleski (1935). In this instance many of the host cells had died. A similar death of host cells associated with a browning reaction of wheat inoculated with different races of *P. graminis tritici* has been investigated by McFadden (1939). The term "brown necrosis" was used to describe the condition.

(*c*) *"False" Browning Lesions.* — The browned areas stained readily with Saffranin O, but not with Sudan III. They were associated with aborted rust pustules in which uredospores were usually entirely absent, although in some pustules a few only were present (Fig. 10). Teleutospores were present on the edges of some pustules (Fig. 10D).

In the stems the browned area was confined to the cells between the fibre layer and the epidermis, except in the region of the associated rust pustule, where it may encircle the fibre bundle (Figs. 8c and 10A). The lumen of the fibre cells in this region also stain with saffranin (Fig. 10B.) The tissues affected with "false" browning are therefore identical to those normally invaded by the rust fungi.

In both stems and leaves a complete necrosis of the host cells in the browned areas had occurred, associated with which was a dense mycelial infection (Fig. 10). In leaves showing "false" browning, many miniature spore-like bodies occurred (Fig. 7). The microscopic appearance of the "false" browning lesions was therefore similar to that of "heated" rust infected tissue.

## *Summary*

A "false" browning disease, associated with a heavy infection of immature, abortive rust (*Melampsora lini*) uredospore pustules, has occurred in flax crops in Victoria, during early November in each of the three seasons 1942 to 1944 inclusive. In each season, the disease was first reported approximately one week after sudden hot spells during which shade temperatures of 80°F. or more were recorded.

Attempts to isolate a causal organism from the lesions have failed.

Lesions identical in appearance to those of natural "false" browning have been produced around rust pustules on leaves and stems of plants of the Liral Crown and Concurrent varieties subjected to a constant temperature of 37°C., and a relative humidity of approximately 85 per cent. for periods ranging from six to 30 hours. The browning was well developed approximately three days after the heat treatment. The most vigorous reactions occurred around very immature uredospore pustules, and after the longest exposures to the heat treatment. Little "false" browning occurred around teleutospore pustules, although such pustules lost the uredospores remaining in the centre and became abortive.

The heat treatment had no effect on the uninfected tissues of the plants.

Histological studies have been made of normal rust infected tissues, heated rust infected tissues, and natural "false" browning lesions.

Rust mycelium may normally extend for a considerable distance from the point of infection. The course of the normal development of the pustule is described. The staining reactions of the haustoria is apparently an indication either of their age or their vigour.

The appearance of tissues affected with "false" browning in both artificially heated and natural specimens was identical. The affected tissues were found to be the same as those normally occupied by rust mycelium. The browning was due to the necrosis of the cells in the affected area associated with a dense mycelial infection. The rust pustules were abortive, and usually were completely devoid of uredospores.

Marked changes were noted in the staining reactions of the haustoria, many of which appeared to be thickened, particularly at the base.

In the tissues of "heated" and naturally occurring leaf lesions, the tips of the hyphae were often swollen to form miniature bodies, which, except for their size, resembled uredospores or teleutospores. No such bodies were detected in normal rust infected leaf tissue.

(Acknowledgment and References will be found at the top of the next page.)

**ACKNOWLEDGMENT**

During this investigation, valuable assistance was given by officers of the Flax Production Committee of the Department of Supply and Shipping, and in particular by Dr. I. F. Phipps. The writer acknowledges his indebtedness in this regard.

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# Care of the Milking Plant

THOROUGH sterilization of the milking plant is essential if high quality dairy produce is to be obtained. For efficiency, simplicity, speed and cheapness of operation, cleansing with caustic soda and boiling water is generally regarded as the best method. This cleansing should be carried out promptly after milking is completed and following a rinse of cold or luke-warm water, by drawing at least one gallon of the solution through each unit of the milking plant.

The correct strength of the solution is one tablespoonful of caustic soda to four gallons of hot water. This strength should never be exceeded where tinned metal is concerned, and if its use at this strength is followed immediately by a rinse of clean boiling water and finally by an application of live steam for several minutes to bring the metal parts to a degree of heat that will ensure prompt and complete drying, no damage to the plant will result. The rubber parts, however, require additional treatment, i.e., subjection to actual boiling in a caustic soda solution, 1 tablespoonful to the gallon. Such a strong solution would ruin the tinning and therefore entails not only the dismantling of the machines, but the segregation of the rubber parts for the separate boiling process. This cleansing of the rubber parts is hardly practicable oftener than once a week, but it should never exceed that interval. The strong soda content promotes a smooth, glazed inner surface to the rubbers, preventing fat, one of the greatest enemies of rubber, from penetrating the rubber ware. This regular once-weekly boiling in strong soda solution is essential to the hygienic and economic preservation of milking-machine rubbers.

When the various small parts of the machines are dismantled for the ordinary after-use washings, particular care should be taken to protect the glazed inner surface of the rubbers. Brushes should not be used, as scoring and roughening would result, and create pockets and lodging places for milk and germs, with serious results to both rubbers and milk quality.

It is important that machine parts, particularly the rubbers, shall be stored in a sanitary place between milkings. This should be in the cleanest available situation, usually the dairy and *not* the cowshed, which it is so tempting to use for the purpose.

[Contributed by the Dairying Division.]

# The Drying of Fruits and Vegetables

By Ruth Bromfield, Fruit Preserving Expert.

At this time of the year, the home garden is apt to produce fruits and vegetables far in excess of immediate requirements. Even after the housewife has bottled much of the fruit and made jams and pickles until her jars, and sometimes her energy, are exhausted, she is still confronted with a surplus which she is reluctant to waste. The problem is easily solved by the economical method of drying. The equipment required is simple and the final product may be stored in a limited space. Further, dried fruits and vegetables are valuable when fresh products are in short supply or out of season. The basic principle in drying fruit and vegetables is the removal of sufficient moisture to ensure their preservation, while retaining the original flavour and colour of the food. This is accomplished by sun-drying, or by the use of an artificial source of heat.

THE main equipment required is a number of trays on which the fruits or vegetables are set out to dry. Some fruits require dipping and sulphuring, and vegetables require blanching as will be described later. The additional equipment needed for these operations may be improvised readily in the home.

Suitable trays may be made by nailing together wooden lathes into rectangular frames and stretching hessian or canvas over them. The trays should be supported 3 or 4 inches above the ground to allow a free circulation of air to facilitate drying. A discarded wire door or window screen, supported on bricks or blocks of wood, makes an ideal tray for outdoor drying.

If the drying is done indoors, either an oven, with the door left ajar, or a small home evaporator, may be used. Detailed instructions for making such a drier are available in a pamphlet, "Fruit Drying for Home Use," which may be obtained free of charge on application to the Director, Department of Agriculture, Melbourne, C.2.

### *Drying*

The fruits or vegetables to be dried, after preparation, are spread in a single layer on the trays. If the climate is warm and reliable, drying can be done out of doors. It may be necessary, however, to protect the drying produce from birds and insects. When a comparatively small quantity is being dried, a sunny wired-in verandah is ideal. The material should be protected from dews and rains either by covering or removing the trays indoors.

The time required for drying depends on prevailing temperatures, size of the pieces and the sort of fruit or vegetables being dried. Rapid drying gives a better colour and flavour, but very high temperatures should never be used as there is a danger of scorching.

If oven-drying is adopted, the door must be left ajar to allow the damp air to escape. A "cool" oven should be used, the drying being done at about 110 to 115 deg. F. for the first two hours and then at about 150 deg. F. until drying is completed.

The pieces should be moved about occasionally during the drying period to ensure even drying. *It is advisable to finish the drying process in the oven, even after sun drying, to kill any insect eggs which may be present.*

All fruits and vegetables should be uniformly dry before packing. Remove them from the trays and place in heaps or bins, so that the moisture from those not quite dry enough is absorbed by overdried pieces. This may take from one to several days.

Dried fruits and vegetables must be stored in a dry place away from insects. Tins, boxes or screw-top jars are suitable containers.

### Cooking.

The dried fruits and vegetables should be first washed and then soaked in boiling water for one to two hours or until the original size is regained. They may be then cooked in the water in which they were soaked. Salt or sugar, as required, should not be added until cooking is almost completed.

### *Treatment for Fruit*

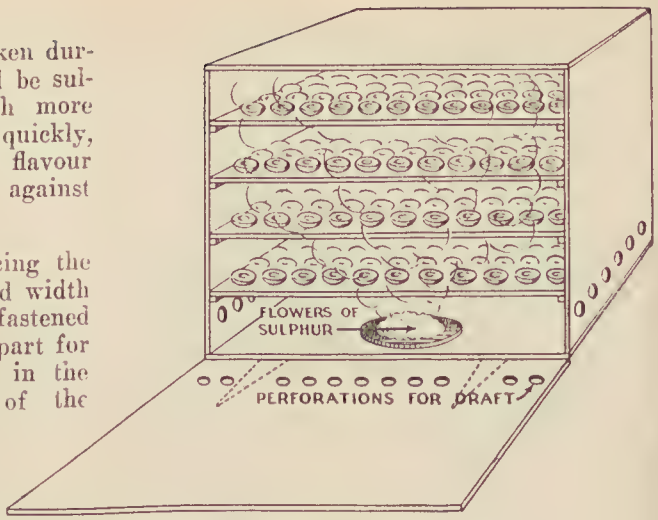
The fruit must be of high quality and fresh. This can be ensured only if the fruit is picked at the correct stage of maturity and any defective fruit discarded.

### Sulphuring.

All light-coloured fruit tends to darken during drying, and to prevent this, should be sulphured. Fruit thus treated is much more attractive in appearance, dries more quickly, retains a higher nutritive value and flavour and is protected to a certain extent against injury from insects.

This process is carried out by placing the trays of fruit in a box of a length and width to admit the trays. Cleats should be fastened on the sides of the box 3 to 4 inches apart for tray rests. The fruit is then placed in the cabinet and enveloped with fumes of the burning sulphur.

The amount of sulphur used is approximately in the proportion of 1 oz. to every 10 cubic feet, but depending somewhat on the length of the process. The sulphur should be placed in a shallow tin on the floor of the box and ignited; if the sulphur is wrapped loosely in paper and the paper lighted, there will be no difficulty in accomplishing this. The box is then closed and the fruit exposed to the fumes, for the length of time indicated for each fruit. When sufficiently sulphured, it is ready for drying.




Sulphur box suitable for sulphuring fruit.
The trays are made of fly-wire or perforated wood.

### Dipping.

Some varieties of fruit which are dried whole are usually dipped in a boiling caustic soda solution, which cuts the bloom and causes minute cracks to open on the surface of the skin, through which moisture escapes more readily than if the fruit is not dipped, thus hastening the drying process.

The solution is made by dissolving 1 oz. caustic soda in each gallon of water used. It is essential that the dip remain constantly boiling. The dipping is momentary, usually for one to two seconds, and the cracks should be scarcely discernible to the naked eye. More pronounced cracking is undesirable. It may be necessary to vary the time of dipping somewhat, but a little experimenting will indicate the correct length of time.

A wire basket such as a frying basket or a large tin cut down and well perforated over both bottom and sides, with the roughness outside, and fitted with a wire handle, will serve the purpose.

*Apricots.*—The fruit should be quite ripe but not mushy. The apricots are usually halved and placed on trays with the cut side uppermost and sulphured as soon as possible. The length of time required for sulphuring is usually four to six hours. The skin should be easily detachable and the juice should have begun to exude into the cup. The flesh should not have become entirely softened. The period required for drying will depend largely on weather conditions and will vary from two to four days. When sufficiently dry, the pieces should be somewhat pliable, yet when twisted about between the fingers, should show no sign of juice or mushiness.

*Apples.*—The mid-season and late varieties give best results, Granny Smith, Cleopatra, and Rome Beauty being among the best. Jonathans are not particularly good for drying. The apples should be fully ripe, but not "floury" or "mealy."

The apples are peeled, cored and sliced into rings $\frac{1}{4}$ inch thick and dropped into a brine solution, two tablespoons of salt to one gallon of water, to prevent discolouration, until all the fruit has been prepared. The rings are then sulphured for 30 minutes. They are dried until soft and velvety to the touch, somewhat like chamois. Another test is to take a handful of the slices, close the hand tightly, pressing the fruit firmly into a ball in the palm of the hand and if sufficiently dry, the rings should be springy enough to separate at once on release.

*Grapes.*—Grapes are dipped for one to two seconds in boiling caustic soda solution, then spread to dry.

*Figs.*—Ripe figs should be selected. The riper, the better the flavour. Genoa and Smyrna figs give the best-flavoured product. Dip in a caustic soda solution for a few seconds and, if desired, sulphur before drying. To prevent the fruit becoming unduly hard, and to destroy insect life, it is considered advisable, before packing, to dip for several seconds in a boiling brine solution (six tablespoons salt to one gallon water) and then place in a heap for a few hours. Press into boxes for storage.

*Pears.*—Williams' Bon Chretien pears are considered the best for drying. The fruit should be picked at the hard stage and ripened indoors. Peel, halve and place on trays with the cut side uppermost. They need to be well sulphured until the pieces are quite soft and difficult to lift from the trays, when they are ready for drying. When sufficiently dry, they should be of a somewhat doughy, "stretchy" texture, when worked between the fingers.

*Peaches.*—The yellow, firm-fleshed free-stone varieties are best for drying. They should be picked when firm and well-coloured and then allowed to stand until fully matured. Treat in the same way as apricots but allow a longer period for drying.

*Prunes.*—d'Agen, Robe de Sargeant are well known drying varieties. Dark-coloured plums need not be sulphured. It is most important that only fully tree-ripened plums should be used. They should be treated for a few seconds in the boiling dip and then spread to dry. When finished, they should have a shrunken skin, the texture should be firm, springy and pliable if pressed in the hand.

Prunes are improved if glossed. This is done by immersing them immediately before packing for a few seconds in a boiling solution of glycerine or sugar and water (one part glycerine or sugar to sixteen parts water) and leaving them covered by a cloth for a day. They will then be ready for packing.

## *Treatment for Vegetables*

For drying, vegetables should be picked fresh and young, the exception being peas which need to be mature for drying.

The vegetables are washed and prepared as for cooking. If shredded or sliced, they will dry more rapidly and retain a better colour. When soaked for cooking they will absorb moisture more rapidly than if cut coarsely. When prepared, the vegetables are blanched. It will be found that blanched vegetables are more easily cooked.

### Blanching.

Blanching is done by dipping in boiling water or steaming for three to five minutes. When dipping green vegetables, bi-carbonate of soda (one teaspoon to one gallon water) may be added to improve the colour. To facilitate handling, vegetables may be dipped in cold water after blanching.

The surface moisture is then wiped off with a cloth, and the vegetables are spread to dry.

Root vegetables become quite hard and dry; other vegetables should be broken and the cut edge squeezed to be sure that no moisture is present. Sun drying may take several days; oven drying six to eight hours. Rapid drying is preferable. Green vegetables are apt to fade in strong sunlight and therefore if dried out of doors, should be kept in the shade. After the vegetables are dry, they should be left in a heap overnight, and if moisture is then apparent, the drying should be continued further before storing.

*French and Butter Beans.*—Only young, fresh beans should be used for the best results. After washing, stringing, shredding and blanching, they are ready for drying.

*Dry Shelled Beans.*—Beans of the Navy bean type are particularly useful for soups. They can be allowed to mature and dry on the plant and then shelled and stored. After shelling, they may be washed and heated in the oven, at a temperature of 160 to 180 deg. F. for fifteen minutes, to kill any insects and prevent losses.

*Peas.*—Mature green peas may be shelled, blanched and dried. It is more satisfactory to dry them indoors.

*Carrots, Parsnips and Turnips.*—These vegetables should be washed, scraped or peeled, and cut into thin rings or sticks. After blanching in the usual way, they are ready for drying.

*Dried Mushrooms.*—Mushrooms may be dried in a manner similar to that used for fruit. They should be first brushed free of soil, peeled and then dried. They do not require blanching. Dried mushrooms make a delicious flavouring for soups and gravies.

# THE AGRICULTURAL LIME ACT

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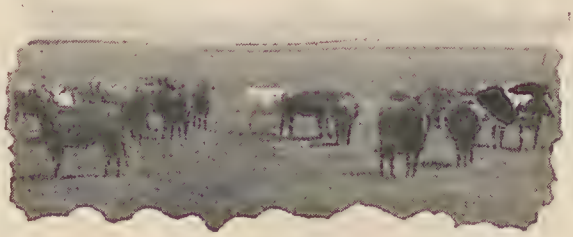
Melbourne, 2nd December, 1944.

W. R. JEWELL, M.Sc.,
Chemist for Agriculture.



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*Issued by direction of the Hon. N. A. Martin, M.L.A., Minister of Agriculture.*


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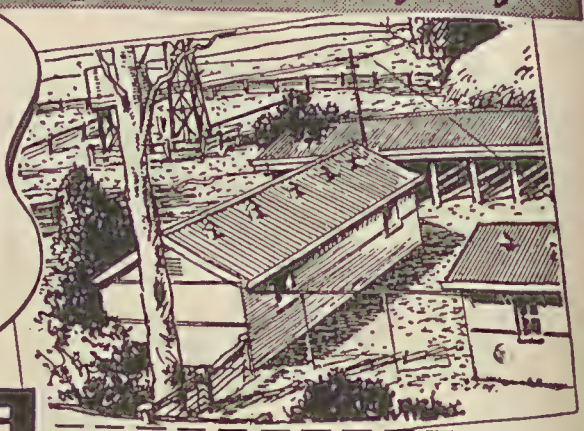

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# VEGETATIVE COVER ON MALLEE SOILS

## An Erosion Control Measure

by Colin G. Webb, M.Agr.Sc., Science Field Officer

The importance of vegetative cover as a means of controlling wind erosion has long been recognized and it is now becoming the practice of some Mallee farmers to establish a vegetative cover in the form of a spring cover crop, which may be grazed judiciously, to protect the bare fallow during the summer period.

In addition, the maintenance of a vegetative cover aids considerably in the more efficient use of a limited rainfall and reduces the amount of surface run-off. Recently there has been a large-scale adaptation of tillage implements for use in dealing with quantities of straw that may be incorporated with the soil or left for protection on the surface.

BEFORE settlement, the virgin mallee scrub acted as a mechanical protection for the soil and it was not until it had been cleared that wind erosion became evident. Over a large portion of the Mallee, cereal stubbles have protected the cultivated areas but, in recent years the rainfall has been insufficient to maintain such an effective cover as formerly, and overstocking has resulted in a greater area becoming stripped of its natural vegetation and exposed to the wind. The results of wind erosion have become still more evident during the past twelve months and now it has become essential that vegetative cover be re-established. Although a proportion of the area will be regenerated naturally, if not overgrazed during the process, it is apparent that a considerable area will have to be sown down by artificial means.

There are several types of vegetative cover which would perform this function. The sowing of cereals has been successfully practised on many Mallee farms. In recent years there has been an increase in the use of ryecorn for this purpose particularly on areas of low fertility. Rye-corn has the advantage of being, at maturity, less attractive to stock than other cereals and possesses a strong straw which will withstand mechanical forces better than that of other cereals. As it gives good early grazing for sheep and there is a good demand for the seed, it also provides an economic return.

Once the land has become stabilized and soil fertility has been restored, a more permanent stability can be achieved by the use of pasture grasses and shrubs. In tests at the Mallee Research Station, Walpeup, research is being conducted into the most suitable pasture plants for this purpose and a number of species have been showing promise under the hard conditions. Lucerne, when established successfully and managed with care has proved itself to be a persistent perennial legume and has responded well to summer rains. Crested wheat grass (*Agropyrum cristatum*) and South African veldt grass (*Ehrharta calycina*) have persisted well, but it is not considered to be a practicable proposition to establish these two perennials at present. Wimmera Rye Grass (*Lolium subulatum*) and barrel clover (*Medicago tribuloides*) have shown promise as annual pasture plants and other medics are being investigated.

A number of plants growing naturally in the Mallee may provide vegetative cover on land which is out of cultivation. Barley grass (*Hordeum murinum*) appears naturally on grassland and provides a good cover, but has an objectionable seedhead late in the season, and it is thought that the other pasture grasses which have a better food value would provide a better economic return. Arabian grass (*Schismus barbatus*) has extended naturally through the Mallee in

Ploughing virgin Mallee land. Note the white sandhill in the background protected from erosion by natural vegetation.

recent years and, while it does not provide a great bulk of feed, has been valuable in covering deposits of sand which have accumulated along roads, &c.

Small Hairy Burr Medic (*M. minima*) and Rough Medic (*M. denticulata*) have appeared naturally on land which has received regular dressings of superphosphate in the past. The Wallaby Grasses (*Danthonia spp.*) and Corkscrew Grasses (*Stipa* spp.) were native to some areas, but have not persisted under heavy grazing. There are several saltbushes which are found in the Mallee. The most common of these are Barrier Saltbush (*Enchlyaena tomentosa*), Two-Spined Saltbush (*Bassia uniflora*) and Creeping Saltbush (*Atriplex semibaccatum*). Old Man Saltbush (*A. nummularium*) is also used as a garden hedge and sometimes for fodder purposes. It has been observed that stock do not graze the saltbushes until they have eaten the neighbouring pasture grasses and, even then only eat the leaves and rarely touch the stems unless there is no other feed available. This factor may be a good one in the maintenance of a vegetative cover as, even if grazed by stock, the plants still retain a root system and stems which will send out leaves again under the stimulus of rain. Unfortunately, however, it is not always possible to control the grazing of the saltbushes to such a desirable limit, particularly in periods of low rainfall, when it is important to maintain a vegetative cover, and it has been demonstrated in the inland areas of Australia that overgrazing will exterminate the saltbushes and leave large areas of ground unprotected from eroding forces. As the natural and introduced species of grasses provide a greater bulk of better feed for stock, the extension of the area sown to saltbushes is not considered to be the best means of establishing vegetative cover in the Mallee.

There are also several sand-binding plants which have uses under special conditions on sand hills and other areas which are not cultivated.

Marram Grass (*Ammophila arenaria*) is useful as a sand binder on dunes near the coast and in parts of the Mallee. Pyp Grass (*Ehrharta villosa*) is becoming widely used in South Australia on sand hills which have been stabilized with ryecorn and which are to be left out of cultivation. This grass has shown promise in this respect at Walpeup. Lyme Grass (*Elymus augustus*) is another plant of this class which is showing promise. Spreading Spinifex (*Spinifex hirsutis*) and Porcupine Grass (*Triodia irritans*) grow naturally in the Mallee and would probably fulfill this function successfully if available in sufficient quantities. One farmer south of Walpeup has established *Olearia* spp. successfully on a sandhill. As all of these plants are in short supply at present and require to be established from roots which must be planted by hand, their use probably will be confined to small special areas where it is not possible to establish the more economic types of crop cover.

### *Summary*

The importance of a vegetative cover as a method of soil conservation is stressed.

Although some of the Mallee areas which have been eroded will recover to a degree with the return of normal seasons, it is apparent that it will be necessary to establish a vegetative cover by artificial means on many areas.

It is considered that the sowing of cereals is the most economic method of establishing a vegetative cover to stabilize an area.

A more permanent stability can be obtained by the establishment of natural and introduced

pastures on areas upon which some of the fertility has been restored. Wimmera rye grass, barrel clover and lucerne are considered to be the most promising plants for this purpose.

Although it is possible to establish saltbushes for this purpose, they are more difficult to establish than cereals, do not provide as much grazing as other plants and are susceptible to overgrazing.

There are a number of sand-binding plants such as spinifex, porcupine grass, marram grass and pyp grass whose use is limited to small areas under special conditions.

The main principle of soil conservation is to establish and maintain a vegetative cover on the area which is liable to be eroded, rather than to concentrate on the establishment of plants to bind soil after it has been blown from its source.

# HERD TESTERS WANTED

A class to enable persons, both male and female, to qualify as herd testers will be held at the School of Primary Agriculture, Swan-street, Burnley, from the 4th to the 20th April next. The class will be free, and successful candidates will be qualified to accept office as herd testers within the Subsidized Herd Testing Associations.

The work of a herd-tester consists of testing and keeping the records of dairy herds in a particular district, and should appeal to those who like an interesting outdoor occupation.

During the past twelve months, the number of cows under test has increased from 25,000 to 60,000, and at the present time, about fifteen new Associations have notified their intention of commencing operations as soon as testers are available.

Particulars of the class may be obtained on application to the Superintendent of Dairying, Department of Agriculture, Melbourne, C.2.

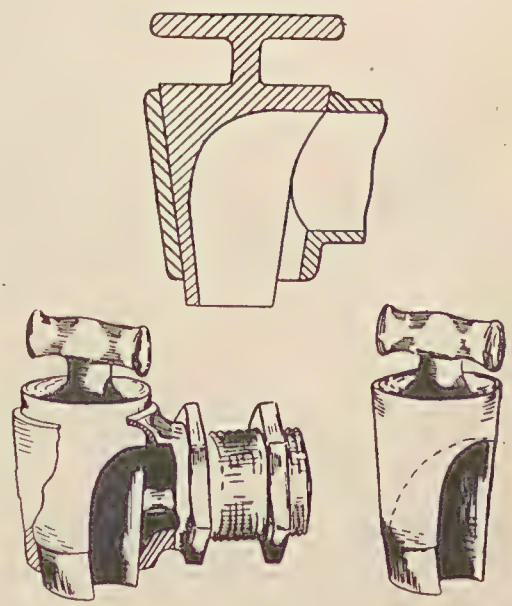
# NEW PLUG-COCK

THE accompanying sketches of a new plug-cock for milk vats and the like, have been approved by the Army Inventions Directorate. The new invention is regarded by Federal and State Departments of Agriculture as an improvement on existing taps.

As the illustrations show, the plug-cock is made to suit standard-sized fittings. All that is necessary is to lift out the present plug-cock and put in the new one ; fitting is as simple as that. The new cock can be cleaned, inside and out, with a scrubbing brush, in a matter of seconds. There are no awkward corners and there is no tubular nozzle.

The inventor, Mr. W. J. Potter of Longwarry North, Victoria, has lodged a patent application.

The device is not yet in mass production, but any manufacturer of dairying or butter-making equipment interested in such a fitting can contact the inventor at the address given above.



# Poisoning of Stock by Plants of the Sorghum Family

Contributed by the Live Stock Division

IT is well known that plants of the sorghum family are capable of developing, under certain growth conditions, a cyanide (prussic acid) content dangerous to grazing stock. Sudan grass is probably, however, the safest member of the sorghum family to use as a forage crop and, if reasonable care be taken, there is but little danger involved.

The following summary of an article by F. T. Boyd, O. S. Aamodt, G. Bohstedt, and E. Truog printed in the *Journal of the American Society of Agronomy,* Vol. 30, No. 7, is a useful outline of the information required in deciding whether sudan grass is safe to graze. As this information is considered important for the comparatively safe sudan grass it will be realized how much more so it should be considered when other members of the sorghum group are being used as fodder.

It is the short, dark-green sudan grass which is high in cyanide and which is dangerous to graze. Second growth, after grazing or removal of a hay crop, when short and dark-green is especially dangerous. Sudan grass which is 2 feet or more in height, whether first or second growth, is low in cyanide and is relatively safe to graze. Sudan grass, short or tall, which is of a pale or yellowish green colour, is low in cyanide and is relatively safe to stock.

Both from the standpoint of danger from poisoning and possibility of obtaining the most pasture, sudan grass should usually not be grazed until it has reached a height of 18 inches and better, 2 or 3 feet. This is best accomplished by having two or more fields so that the cattle may be rotated from one to another.

A high level of available nitrogen and a low level of available phosphorus in the soil tend to increase the poison content, while a low level of available nitrogen and a high level of available phosphorus have the opposite effect. A high cyanide content may still occur in short plants however, especially in the second growth, even though the level of available phosphorus is high. A high level of available phosphorus along with other favourable growth factors makes it possible for the plant to attain quickly a height of 2 to 3 feet, at which stage it is relatively free of poison.

Drought probably operates as a factor, largely by keeping the plants small when they are always much higher in cyanide than when larger. Drought keeps the plants small by withholding water and probably lessening the availability of phosphates to plants much more than that of nitrogen. Autumn or early spring ploughing followed by cultivation should be practised on fields to be sown to sudan grass so as to conserve moisture and prevent the ill effects of drought.

When sudan grass is dried and made into hay without undue exposure and then well stored, the cyanide content does not change greatly. Since it is usually not cut for hay until it reaches a height of 3 feet or more, there is little if any danger of cyanide, poisoning from sudan grass hay. However, if short sudan grass, high in cyanide, is made into hay, it will be dangerous as a feed.

Cattle, when turned into sudan grass of high poison content, usually stop eating after about fifteen minutes, due to the action of the poison. If the animals are not too hungry and are in a state of vigor, they may stop eating before they take a fatal dose. The amount of cyanide that is fatal to cattle varies with the condition of the animals; if they are in a low state of vigor and very hungry, they are more apt to eat a fatal dose than when the opposite is the case.

The action of prussic acid is so sudden that it is rarely possible to treat an animal once symptoms become apparent. In cases where death does not occur immediately a drench consisting of half a teaspoonful of potassium permanganate and 2 lb. of glucose or molasses in a quart of water should be administered. Other cattle in the herd which are not showing symptoms should be taken from the paddock and fed freely with some other fodder, preferably lucerne.

# Native Trees and Shrubs as Feed for Stock

By COLIN G. WEBB, M.Agr.Sc., Science Field Officer

Rolling down mallee scrub in the early days of Mallee settlement.

FOR the purposes of a brief review of Victorian agricultural and grazing practices, the State might conveniently be examined district by district. These districts are Mallee, Wimmera, Western, North Central, Central, Northern, North-Eastern and Gippsland. Some notes on each are set out hereunder.

### *THE MALLEE*

The Mallee is situated in the extreme north-west of the State. This province was originally covered with thick, stunted scrub, with "mallees" (species of eucalypts) predominating. This scrub was cleared originally for the purpose of wheat growing but, in recent years, a system of diversified farming has developed, involving the use of more live stock. The pastures are mostly naturally-occurring grasses or sown cereals and, in times of drought, it has been the practice to utilize some of the uncleared scrub in the unsettled areas for stock feed. The scrub is usually regarded as an emergency food supply for use in such periods, and the area is not considered to be one where sheep can be wholly maintained for any length of time. This area is dealt with more fully in subsequent pages. Along the Murray river, as at Mildura for example, the water has been used for the irrigation of orchards, vineyards and for vegetable-growing.

### *THE WIMMERA*

The Wimmera as a whole is a wheat-growing area, although the number of sheep is increasing, especially in the Kaniva district. The soils are mainly self-mulching grey or red and the rainfall is 15 to 20 inches per annum. There is little scrub, apart from the Mallee Fringe country in the north and some hills on the southern boundary. The stock graze almost wholly on the plains.

### *THE WESTERN DISTRICT*

The northern portion of the Western District consists of undulating plain-country, and is one of the finest sheep districts in Australia. Small areas of wheat, oats and flax are grown within this portion. The southern part of this region, particularly adjacent to and south of the Geelong-Port Fairy railway line, is a

Map I.

rich dairying district. Potatoes are grown to the south of Colac where there is some forest country which, however, is little used for grazing. There is some scrub country in the south-west of the district and also on the State border west of Casterton, but fodder conservation in the district has been developed to such an extent that stock are rarely depastured in this scrub. The rainfall varies from 25 inches per annum in the north to 70 inches in the ranges south of Colac.

### *THE NORTHERN DISTRICT*

The Northern District is typically a large plain which supports a number of industries such as cereal and wool growing, fat lamb raising, the cultivation of vegetables and orcharding. Several areas are under irrigation. There is some forest country on the western, southern and eastern boundaries, but this is used for the production of timber and charcoal rather than grazing which is confined to the plain country and irrigation areas. The soils are mainly red to brown clay and clay loams and the rainfall ranges from 15 to 30 inches per annum.

### *THE NORTH-CENTRAL DISTRICT*

The North-Central District is situated in hill country, mostly on the Great Dividing Range, and although there is a large area of forest, it is not used for grazing except in the extreme eastern corner where the mountains are used for summer grazing when stock graze more on the snow grasses than the scrub flora. The cleared country is used for orcharding, grazing and the production of grass seed while there is some cultivation in the western portion of the district. The rainfall ranges from 20 inches per annum in the west to 40 inches in the east of the area.

### *THE CENTRAL DISTRICT*

The industries of the Central District may be broadly defined as those which supply the Melbourne market, namely, hay-growing, dairying, fat lamb raising, orcharding, vegetable growing and the production of small fruits and berries. The valleys in the mountains to the east of Melbourne are used for dairying, but grazing seldom extends into the forests. To the west of Melbourne where the rainfall is less than 20 inches per annum,

the soils are stiff clays but deep loams are found in the mountains where the rainfall reaches 60 inches.

### *THE NORTH-EASTERN DISTRICT*

Except in the north-western corner and along the river Murray, where there is some cultivation, grazing and vineyards, and along the river valleys, where there is some dairying, stock fattening, orcharding, hop and tobacco-growing, the North-eastern District consists of mountainous country much of which is under snow for several months of the year, and supplies summer grazing for the rest of the year. The rainfall reaches 80 inches per annum in the mountainous portion of the district while it is down to 23 inches per annum on the red clays and grey loams around Rutherglen.

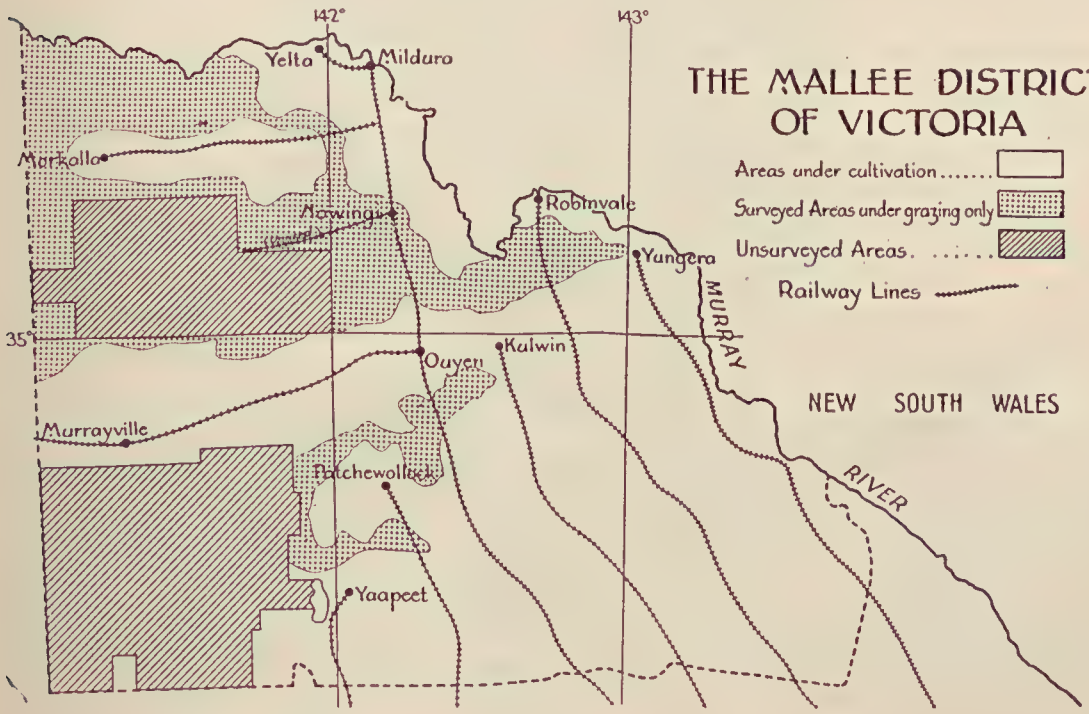
### *GIPPSLAND*

West of Bairnsdale and south of the more mountainous country, Gippsland provides some of the most concentrated dairying country in the State. Maize is grown on the rich river flats while the flax industry has lately been established at several centres. There is some sugar-beet grown around Maffra. The forest in the extreme eastern corner is not much used for grazing, but it is the practice of some graziers to burn the coastal scrub between Foster and Bairnsdale and graze their stock on the resultant fresh growth. The rainfall ranges from 25 to 50 inches per annum.

### *Scrub Grazing*

From the above brief survey, it will be seen that the grazing of scrub country in Victoria is not of major importance, but is conducted more in the nature of a temporary expedient when supplies of more desirable fodder are scarce, and is almost wholly confined to the Mallee District where the problems of fodder conservation, soil erosion, and the reclamation of semi-arid lands are so important.

The Mallee District covers an area of 11,000,000 acres and the soils are extremely light, except in the south-eastern portion of the district, and are highly alkaline. The rainfall ranges from 15 inches per annum in the south (Beulah, 14·45 in.) to 10 inches per annum in the north (Ned's Corner, 10·4 in), and is very unreliable. It may be seen (Map 2.) that a considerable portion of the




Map 2.

Typical timber on the Mallee Research Station, Walpeup, prior to clearing.

area west of the 142nd. meridian (longitude) has never been surveyed for settlement and is regarded as being a "desert." Most of this area is used for light grazing except where it has been reserved as a National Park. It may be seen also that a great portion of the surveyed area north of the 35th. parallel (latitude) is not, at present under cultivation and has either reverted to natural scrub or blocks have been abandoned and are now being used for grazing.

Settlement is mainly confined to the vicinity of railway lines in this area. In this district stock were originally watered by means of catchment, ironclad and log-lined tanks, bores and water carted by waggon or truck, but the Stock and Domestic Irrigation System now serves a large portion of the grazing area and supplies a more reliable source of water. This system is supplied from the Grampians Storages, the water from which is joined by the Waranga Western Irrigation Channel at Beulah East. As far as is known it is the largest scheme of stock and domestic supply in the world. Covering an area of 11,000 square miles (one-eighth of the State of Victoria) with 6,332 miles of channels, the system had reached its limit for gravitation purposes in 1939 (3).

There is comparatively little grazing of scrub in the south-eastern portion of the district where the area has been settled for a longer period, the soils are heavier, and the rainfall is slightly higher than the rest of the district.

## *Mallee Flora*

The flora of Mallee district have been described by Hardy (2), McTaggart (4), and Zimmer (9), while Ewart (1) has given a more detailed description of the individual species. Zimmer (9), (10) has classified the vegetation into six types:—

**Type 1. Box Flat Areas.**

TREES.—Valuable as timber: *Eucalyptus rostrata* (River Red Gum); *E. bicolor* (Black Box); *Callitris robusta* (Murray Cypress Pine); *Casuarina lepidophloia* (Belar).

Useful fodder value: *Heterodendron oleiofolium* (Cattle Bush).

Doubtful fodder value: *Fusanus acuminatus* (Sweet Quandong); *Acacia Victoriae.*

*Callistris robusta* has also been fed to starving stock.

SHRUBS.—Useful fodder value: *Chenopodium nitrariaceum* (Branching Goosefoot).

Doubtful fodder value: *Eremophila divaricata* (Spreading Emu-bush); *E. polyclada* (Twiggy Emu-bush); *Myoporum montanum* (Water bush); *Muehlenbeckia Cunninghamii* (Tangled Lignum); *Sida corrugata* (Dwarf Sida); *Exocarpus stricta* (Pale fruit Ballart).

**Type 2. Pine Belar Buloke Areas.**

TREES.—Valuable as timber: *Callitris propinqua* (Slender Cypress Pine); *Casuarina Luehmannii* (Buloke); *Myoporum platycarpum* (Sugarwood).

Useful fodder value: *Myoporum platycarpum* (Sugarwood); *Casuarina Meulleriana* (Slaty Sheoak).

Doubtful fodder value: *Fusanus persicarius* (Bitter Quandong).

SHRUBS.—Useful fodder value: *Cassia eremophila* (Desert Cassia).

Doubtful fodder value: *Nitraria Schoberi* (Nitre bush); *Beyeria Leschenaultii* (Pale Turpentine bush); *Dodonaea attenuata* (Slender Hop-bush); *Eremophila glabra*

(Dwarf Emu-bush); *E. longifolia* (Berrigan); *Jasminum lineare* (Desert Jasmine); *Scaveola spinescens* (Prickly Fan-flower).

**Type 3. Tall Mallee Areas.**

**Type 4. Small Mallee Areas.**

**Type 5. Stunted Mallee Areas.**

Shrubs in Types 3, 4 and 5.—Doubtful fodder value: *Blennodia trisecta* (Woody Cress); *Olearia magniflora* (Splendid Daisy bush); *Westringia rigida* (Stiff Westringia); *Dodonaea bursarifolia* (Small Hop-bush); *Myoporum desertii* (Turkey bush); *Olearia rudis* (Azural Daisy bush); *Baeckea Behrii* (Broom Heath Myrtle); *Lycium australe* (Austral Boxthorn); *Mesembrianthemum australe* (Rounded Pigface) is useful when dry.

**Type 6. Saltbush Plains.**

Valuable as fodder: *Atriplex Muelleri* (Lagoon Saltbush); *A. semibaccatum* (Berry Saltbush); *Rhagodia nutans* (Nodding Saltbush); *Tochia sedifolia* (Dense Bluebush); *Enchlyaena tomentosa* (Barrier Saltbush); *Chenopodium nitrariaceum* (Branching Goosefoot).

Fair fodder value: *Atriplex angulatum* (Angular Saltbush); *A. nummularium* (Old Man Saltbush); *A. vesicarium* (Bladder Saltbush); *A. rhagodiodes* (Silver Saltbush); *A. campanulatum* (Bell Saltbush); *Rhagodia hastata* (Saloop Saltbush); *R. gaudichaudiana* (Cottony Saltbush); *R. crassifolia* (Fleshy Saltbush); *R. spinescens* (Thorny Saltbush); *Bassia uniflora* (Two-spined Saltbush); *Chenolea tricornis* (Three-horned Saltbush); *Kochia brevifolia* (Short leaf Bluebush); *Chenopodium album* (Fat Hen).

There is little scrub grazing on Type 1 area which has been mostly cleared and permanently settled. In the writer's opinion Types 2, 3, and 4, where not cleared for settlement, provide the most valuable scrub feed. The grazing value of these types depends more on allied shrub species, as indicated above, than on the dominant vegetation types. Type 5 is, in itself, of such a low carrying capacity that graziers prefer to use volunteer grasses and shrubs, such as Mediterranean grass (*Schismus barbatus*) and species of Crowfoot (*Erodium* spp.) which appear after a fire. Large areas of Type 6 have been grazed in the past, but sheep have overgrazed it to such an extent, and regeneration is so slow, that unless every care is taken in the future, the vegetation will disappear and erosion dangers will become more evident.

Although Ewart describes Cattle Bush (*Heterodendron oleifolium*) as being a

Top—Typical Wimmera grey soil, wheat-growing country which originally supported little native vegetation.
Left—Gippsland hill country. Right—Whipstick Mallee country before clearing.

Burning big mallee at the Mallee Research Station.

second-grade fodder only, most graziers regard it as the most valuable fodder tree in the area. It is often cut for stock in times of drought and under normal conditions is always neatly trimmed to the maximum reach of stock. The leaves are said to contain a poisonous property but the writer has no knowledge of stock deaths from this cause. Scrub Pine (*Callitris verrucosa*) has also been cut and fed to stock. Belar (*Casuarina lepidophloia*) and Buloke (*C. Luehmanii*) are sometimes cut for stock, but the latter is reported to cause impaction when used alone. Hop Bush (*Dodonaea spp.*) is also eaten by stock. Desert Banksia (*Banksia ornata*) is grazed after fire on a large area south of Murrayville. Although stock chew young Mallee shoots and bark, the eucalypts in general are regarded as being valueless for fodder.

The Emu bushes (*Eremophila* spp.) are reported to contain poisonous properties but stock have been observed to eat the leaves of *E. longifolia* without apparent injury. Pescott (5) suggests that plants of the genera of *Euphorbiaceae* (Desert Spurges); *Swainsona* (Wild Peas); *Solenacae* (Thornapples) and *Convolvulaceae* (Dodders and Bindweeds) be regarded with suspicion for their poisonous properties. It is interesting to note that the district flora has deteriorated to a far greater extent under the close grazing of sheep, which tend to concentrate in the vicinity of waterholes, than of cattle which can roam further afield in search of fodder and which do not bite so closely into the young shoots.

### Commercial Value.

Although the commercial value of Mallee scrub is low, there are a number of ways in which it is utilized by man. Murray Pine (*Callitris robusta*) and Belar are widely used for fencing posts. The former has the advantage of being easily bored and resistant to termites ("white ants") although a susceptibility to "dry rot" reduces its value for fencing and building purposes.

Belar posts, which are difficult to bore when dry, are susceptible to a rot if the bark is not removed before they are set in the ground. Many farm buildings have been erected with Pine and Belar while Mallee branches have been used for thatching sheds, stables, pig sties, &c., as well as for brushwood fences. Pine has also been used for log fences while Pine and Belar have been used for building sheepyards. Pine posts are used in the irrigation districts for making vine trellises. The root stocks and butts of Mallee eucalypts are in great demand as "Mallee roots" and form a substantial portion of the firewood supplies in the larger cities. Mallee eucalypts are also

Soil erosion caused by mismanagement of cleared Mallee land.

sources of honey, which is rarely pure owing to the irregular flowering season. Some eucalypts, mainly *E. oleosa*, are distilled for oil and, particularly in recent years, Green Mallee (*E. viridis*) has been burned for charcoal. There has been a trade in Sandalwood (*Myoporum platycarpum*) for religious purposes in the Far East. The fruits of the Sweet Quandong (*Fusanus acuminatus*) are eaten and also made into jam and jelly.

### *Soil Erosion and the Problem of Derelict Marginal Lands*

The question of soil conservation and the reclamation of derelict marginal lands is of major importance. With the knowledge that such lands will revert to scrub (if not prevented from doing so by grazing stock or vermin), and that erosion is controlled when the soil is held by scrub, there is a temptation to declare that all such areas should be abandoned and allowed to revert to scrub. Such a course may possibly be justified if stock and vermin would permit such a reversion, if there were no other means of controlling soil erosion, and if the reverted scrub would not become a harbour for dingoes, foxes, rabbits and other pests, whose depredations would result in a further diminution of the settled area under cultivation. In addition there has been a large amount of private and public capital invested and this would be lost if the area were allowed to revert to its natural state.

There is no doubt, however, that the derelict marginal area is a menace under its present system of management. Graziers, on short-term leases and with little interest in the properties, are overgrazing abandoned blocks, stripping them of all natural cover and paying little attention to maintenance or to vermin control. This treatment continues until soil erosion renders the land of little further use for any purpose. The blocks are then abandoned to become breeding grounds for vermin and nuclei for the spread of soil erosion to the detriment of neighbouring blocks. It is possible that it would be preferable to allow certain areas such as the white sandhills to revert to scrub, but research workers in this area are confident that many of the derelict marginal lands, which are now either reverting to scrub or deteriorating because of erosion, can be reclaimed under wise management. Such reclamation is possible only if ground cover is established and vermin controlled.

Sims (6) (7) and Webb (9) have concluded that the establishment of a ground cover is possible under suitable conditions. Once a ground cover has been established it should be maintained by careful management which includes sound cultivation methods and stocking, fodder conservation and vermin control. Such areas would be a greater asset to the Nation if reclaimed, than if allowed to revert to their original state.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## Short Courses in Milk and Cream Testing and Buttermaking

If a sufficient number of candidates offer themselves, free courses in each of the above subjects will be held concurrently at the School of Dairy Technology, Werribee, from 17th April to 28th April, 28th May to 9th June, and 23rd July to 4th August. Each session will be limited to fifteen candidates, either male or female. On the completion of each course, examinations for certificates will be held in Melbourne by the Dairy Produce Board.

Application forms may be obtained from any dairy factory manager or from the Director of Agriculture, Melbourne, C.2, and must be lodged not later than 7th April for the April session, 19th May for the May–June session, and 14th July for the July–August session.

# War Agricultural Committee Notes

## Compiled by the Central Executive

THE exceptional drought conditions which are being experienced throughout the northern and north-western portions of Victoria have caused a serious reduction in the number of horses available for the preparation and sowing of the 1945 cereal crops.

Many thousands of horses have been transported from the drought areas to agistment in more favoured portions of the State and these horses, thanks to the generosity of the farmers who have accepted and looked after them, are now in good condition. Owing to the extreme shortage of fodder in their home districts however, difficulty will be experienced in arranging for the return of many horses in the cereal-growing areas for the preparation and sowing of this season's crop.

In an endeavour to meet the emergency the Victorian Department of Agriculture is making every effort to have additional tractors made available for cereal-growing. The serious position in Victoria has been impressed upon the Commonwealth Authorities with a request that arrangements be made to procure as many suitable tractors as possible. However, the number available is expected to be very much short of the number required.

It is likely, therefore, that some farmers in the cereal-growing areas may not be able to obtain the necessary motive-power to sow their crops.

Reports indicate that many farmers throughout the Mallee and Wimmera are planning co-operative efforts to assist one another with the coming seeding programme. In order that the maximum use may be made of the tractors already in the field District War Agricultural Committees have been requested to assist in organizing these efforts. Farmers who have tractors at present out of action, due to a lack of spare parts or for any other reason, should contact their District War Agricultural Committee. In the meantime the Central Executive is doing its utmost to locate spare parts, particularly for earlier models, so that every assistance may be rendered to such farmers.

Good neighbourliness has always been a notable feature of Victorian farming communities and a fellow farmer in difficulties never fails to call forth a helping hand from his neighbours On numberless occasions this unprompted, co-operative assistance has been the means of saving a desperate situation. The Department of Agriculture therefore believes, when tractor owners generally realize the seriousness of the situation, that a prompt and generous response will be made to the appeal for tractors. This co-operative effort is essential if the 1945–46 crops are to be a success. These crops are urgently required to produce grain for human consumption and stock feeding and hay that will enable horse teams to be returned to their home districts to put in the following year's crops.

Farmers who are able to assist by sowing additional areas for others under contract arrangements should advise their District War Agricultural Committee, which will place them in touch with neighbours requiring assistance. Similarly, any farmer who has not the means of sowing his crop, but who is prepared to accept assistance at the contract rates ruling in his district, should advise his District Committee. Many of the difficulties associated with the bringing together of interested parties will thus be overcome.

Tractor owners from nearby districts who are not cereal growers are also asked to co-operate. Many tractors from other agricultural industries are idle at the end of the harvest, and would be a valuable help in wheat-growing areas. War Agricultural Committees in the cereal-growing districts will welcome suggestions and offers from the owners of such machines.

To meet Australia's requirements of cereals the Commonwealth Government has set production goals for each State. For 1945–46 Victoria's production goals for the main cereals are: wheat, 2,400,000 acres; barley, 220,000 acres; oats, 1,300,000 acres. To reach these figures full co-operation will be needed and every farmer able to do so is asked to help. Suggestions and offers to co-operate will be welcomed by District War Agricultural Committees.

# Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

### *Meat Production*

FROM information at present available, it appears that 255,000 tons of meat will be obtained from slaughterings of cattle, sheep, and pigs in Victoria this year. This figure includes aproximately 100,000 tons of beef and veal, 125,000 tons of mutton and lamb, and 30,000 tons of pig meats, and is somewhat less than the production of recent years.

Beef and veal production however may exceed 100,000 tons, due partly to the good season in most of the beef-producing areas and also to the fact that dairy cattle, particularly dairy cows, are still being slaughtered in heavy numbers.

Mutton and lamb production is less certain, due to the severe drought in the Mallee, Wimmera, and Northern districts, and in the Riverina. The effect of the drought on mutton and lamb production in these districts is partly offset by the relatively good season elsewhere.

Pig breeding stock have been built up during the past season, and, if farmers receive sufficient feed, the quantity of pig meats produced will greatly exceed the estimate of 30,000 tons. If not, this estimate will be reached by the untimely slaughter of breeding stock.

### *A Productive Dairy Cow*

The worthwhile cow is the one which is regular in its breeding habits, and a consistently heavy milker over a number of years. An example of this type of animal was "Victoria Volt," a Red Poll cow bred at the State Research Farm, Werribee.

"Victoria Volt" died recently at the age of 13½ years. During her lifetime she bore sixteen calves, including four sets of twins, and produced in eleven lactations, each of 273 days, almost 50 tons of milk and 2¼ tons of butterfat, as detailed on the next page.

The greatest time elapsing between successive calving was 13½ months, and twins were born in 1937, 1940, 1943, and 1945. The twinning characteristic appears to be a definite family trait. The grand-dam of "Victoria Volt" had three sets of twins, her dam (a twin herself) had one set, and one of her daughters has had one set of twins. Other members of the family have also produced up to four sets of twins.

"Victoria Volt" was the first calf of "Victoria Eructation," and her production figures certainly do not support the contention that the first offspring of a heifer is not worth rearing.

| Date of Calving. | Lactation. | Milk. | Average Test. | Fat. |
|---|---|---|---|---|
| | | lb. | | lb. |
| 15.10.33 .. | 1 | 6,473 | 4·58 | 296 |
| 9.11.34 .. | 2 | 7,811 | 4·72 | 369 |
| 5.11.35 .. | 3 | 8,913 | 4·46 | 398 |
| 25.10.36 .. | 4 | 11,001 | 4·68 | 515 |
| 10.10.37* .. | 5 | 12,853 | 4·18 | 537 |
| 12.10.38 .. | 6 | 11,975 | 4·28 | 512 |
| 28.11.39 .. | 7 | 11,014 | 4·45 | 490 |
| 14.11.40* .. | 8 | 10,521 | 4·15 | 437 |
| 20.11.41 .. | 9 | 10,836 | 4·20 | 455 |
| 29.11.42 .. | 10 | 10,331 | 4·23 | 437 |
| 15.12.43* .. | 11 | 9,860 | 4·38 | 432 |
| 20.1.45† .. | .. | .. | .. | .. |
| | | 111,588 | | 4,878 |
| Average .. | .. | 10,144 | .. | 443 |

* Twins. † Twins. "Victoria Volt" died on 26.1.45.

## *Lambing Ewes*

Profits in fat lamb production often depend largely on careful attention at lambing time, but the treatment of breeding ewes during the period of pregnancy also plays an important part in ensuring a successful lambing season with strong, vigorous lambs.

All ewes should be well accustomed to the farmer and his dogs moving among them before lambing commences. This is especially important in the case of maiden ewes which, if startled, may desert their newly-born lambs. The tendency of young ewes to bolt away can often be checked by running older sheep with them.

It is advisable to construct in each paddock a small pen into which ewes which refuse their lambs can be placed until they "mother up." The pen can also be used for inducing ewes which have lost their own lambs to adopt twin lambs or a lamb which has lost its own mother.

Crutching, which is usually performed about four weeks before lambing, is now generally accepted as being imperative. The operation reduces the risk of blowfly strike, and enables lambs to be born and to suckle under more hygienic conditions than exist if long wool in the breech area is stained with urine and matted with dung. Whenever necessary, wool from around the eyes should be removed at crutching time.

Rough dogs, careless operators, and overcrowding in yards during crutching or at any time should not be tolerated.

Although ewes in poor condition may have insufficient milk, it is not necessary to keep sheep fat throughout pregnancy. Ewes which have sufficient feed to maintain or slightly increase their weight and strength during the first four months, and which are fed well during the last month will produce lambs of normal size and strength, and have a good milk supply. Most losses among ewes and lambs occur when the ewes are falling in condition.

[J. T. Kelly, B. Agr. Sc.,
Science Field Officer.]

## *Carcass Yield of Pigs*

A humorous definition sometimes given of an "expert" is, "One who gives quick answers and is sometimes right."

The writer is frequently asked the percentage yield of carcass from a pig the liveweight of which is known. To give a quick and precise answer to such a question would be to qualify for the above definition of an expert.

Extensive records of actual liveweights and carcass weights of pigs are available, and from groups of these records averages have been calculated. However, the main lesson the records teach is that there is substantial variation in the percentage yield of carcasses, and that several factors contribute to that variation.

Carcass yields are known to vary between 60 per cent. and 80 per cent. of the liveweight, and while an assumed yield of 70 per cent. is frequently used for rough estimates, some tolerance above and below the 70 per cent. must be allowed for conditions which cause the percentage yield to vary.

The percentage yield of carcass increases as—

1. The weight of the pig increases.
2. The fatness of the pig increases.
3. The nature of the pig's diet becomes more concentrated.
4. The period between the last feeding time and the live-weighing time increases.
5. The period between the time of live-weighing and slaughtering decreases.

The factor causing the greatest variation in percentage yield of carcasses is the quantity of food in the pig's body when the liveweight is taken. The weight of this food depends on the size of the pig and its degree of maturity (fatness), the proximity of the weighing time to the previous feeding time, and the nature of the food. A bacon pig, the daily diet of which consists of 4 gallons of separated milk and 2 lb. of grain, carries a greater weight of food in its body soon after feeding than a pig on a diet of 2 gallons of separated milk and 4 lb. of grain.

The meat trade generally deals with cold carcass weight of pigs, including the head, feet, backbone and flare, and if the carcass is weighed within an hour after slaughter, an adjustment is made to the actual weight to allow for a loss of approximately 3 per cent. through evaporation during the time the carcass is cooling after slaughter.

To estimate the percentage yield of carcass in the absence of actual results under practically identical conditions, it is suggested that a yield of 70 per cent. be used as a basis for calculation, but this assumed yield should not be used to dispute actual results.

[L. A. Downey, H.D.A., Pig Expert.]

### *Poultry*

The equipment required for a new poultry farm depends of course on the ultimate extent to which it is proposed to develop the farm, and if possible this should be decided at the commencement to avoid scrapping good equipment for large equipment or buildings later on. Maximum efficiency, within reasonable limits of expenditure, should be the key to the design of any well-laid-out and equipped poultry farm. Labour saving methods and appliances should be adopted wherever practicable.

Provision should be made for a food-store and mixing-room, egg-room, incubator-room, brooder-house, movable chicken colony houses, breeding pens, and laying houses. On stud farms, single testing pens are essential.

The food store should be rat and mouse-proof, and large enough to store reserve stocks of food. If the poultry farm is a large one it is an advantage to erect electrically-driven crushing and mixing appliances, to reduce labour costs to a minimum.

The egg-room should be airy, cool and well protected from the north. Plenty of shelving should be provided. Scales for weighing eggs and a candling device for testing them are necessary. Many washed eggs have deteriorated during storage, and care should be exercised in the purchase of egg-cleaning appliances. In any case the use of such machines should be avoided if possible by the production of eggs clean from the nest. This may be largely accomplished by providing clean nests and litter for the birds.

The incubator room should be large enough to accommodate the largest incubator that may be required in the future, and for comfortably handling eggs and chickens. The modern electric incubator occupies very little room in comparison with the old type of machine.

The brooder house should face north, with provision for the chickens to run out on grass runs, or to have direct sunshine, which is necessary for their best development. The heat required for the chickens may be supplied by water pipes heated by gas, electricity, or kerosene lamps. A system of electrically-heated hovers has given satisfaction. Other systems, such as battery brooders or air-conditioned rooms are in use, but these require experienced operators, and because of the artificial conditions in which the chickens are reared under these systems, the laying flock produced from this stock could quite easily become lowered in constitutional vigour by inexperienced operators. Portable colony houses on free range have given the best results for the growing chickens.

The breeding pens should be provided with comfortable sleeping quarters for the birds. Outside runs are an improvement, if well managed, as the birds are maintained under more natural conditions.

Laying houses should be provided with concrete floors, and 4 square feet of floor space should be allowed for each bird. A house 20 feet square will accommodate 100 birds. Laying houses require perches, nests, food hoppers, automatic drinking vessels, and floor litter.

Single test pens may be built approximately 6 feet by 3 feet. These pens are useful to ascertain the exact number of eggs a bird lays in a given period, and the shapes and sizes of eggs laid. They may also be used for special matings.

On a properly managed poultry farm, some system of bookkeeping is essential. The simpler the system adopted the more likely the transactions will be entered regularly and accurately. The principal expenditure is incurred in the purchase of foodstuffs and the main source of revenue is the sale of eggs.

[H. F. Clinton, Poultry Expert.]

### *Bee-keeping*

The time is now opportune to replace any queens that are likely to fail during the winter. Replacements can be obtained by purchasing from reliable breeders, or they can be reared in the apiary if conditions are favourable.

If the queens are purchased it is a good plan to commence feeding the colonies which are to receive them a week previous to introduction, and for one week after. This puts the colony in good condition to receive the queens, and cut losses considerably if the honey flow is absent.

Care must be exercised to eliminate robbing as it is most detrimental to queen introduction. It is best to feed at dusk when the apiary is inactive.

Autumn increase may also be made by dividing the strong colonies, and introducing a queen to each division.

An overhaul and painting of material in the apiary should be carried out before the wet weather sets in, as the wood is in a good condition to receive the paint. The workshop is the best place for this work as it can be carried out thoroughly there and any repairs may be attended to more conveniently.

[W. A. Collins, Apiary Inspector.]

# Tubercle-free Herds

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

| Name. | Address. | Number in Herd. |
|---|---|---|
| Aboriginal Station | Lake Tyers | 109 |
| Armstrong and Son | Wangaratta | 105 |
| Ballarat Orphanage | Ballarat | 105 |
| Banyule Stud Pty. Ltd. | Wangaratta | 54 |
| Black, I. S., Estate | Mount Noorat | 53 |
| Clark, W. J. | Monomeith | 130 |
| Cribbes, T. | Wangaratta | 39 |
| Deering, J. T. | South Wangaratta | 61 |
| Dennis, Mrs. A. A. | Frankston | 23 |
| Dookie Agricultural College | Dookie | 85 |
| Geelong Grammar School | Corio | 78 |
| Gorman, A. W. | "Cathcart," Alexandra | 57 |
| Griffin, G. W. | Gladysdale | 49 |
| Griffiths, J. G. | Benalla | 121 |
| Howlett, Mrs. G., and Miss E. Samuel | Lang Lang | 55 |
| Jakobi, L. W. | "Granada," Yannathan | 89 |
| Kane, F. E. | Warrnambool | 28 |
| Kilmany Park Farm Home for Boys | Sale | 105 |
| Lady Talbot Milk Supply Co. | Cranbourne | 489 |
| Lawrence, P. H. | "Rainga," Tarrawarra | 83 |
| Longerenong Agricultural College | Dooen | 48 |
| Maloney, P. J. | Tongala | 66 |
| Murray, M. G. | Lima | 26 |
| McNabb and Son, G. A. | Irrewillipe East | 154 |
| Nancarrow Bros. | Kerang | 47 |
| Noonan, G. | Benalla | 31 |
| Noonan, Mrs. S. A. | Benalla | 35 |
| Northcote Children's Farm | Bacchus Marsh | 165 |
| Onley, W. H | "Glenholme," Caldermeade | 67 |
| Parker, Mrs. L. M. | Tallarook | 67 |
| Payne, A. E. T. | "Yarra View," Lilydale | 66 |
| Payne, . E. N. | "Woodburn," Kilmore | 44 |
| Poole, M. A., and D. | Caldermeade | 155 |
| Poole, M. A., and D. | Yannathan | 79 |
| Powell, T. S. | "Carellen," Mansfield | 43 |
| Richardson Bros., Messrs. | "Faldinghurst," Upper Beaconsfield | 53 |
| Roe, Thomas H. P. | Cobram | 27 |
| School of Horticulture | Burnley | 6 |
| State Experiment Farm | Rutherglen | 37 |
| State Research Farm | Werribee | 245 |
| Stephens, Dr. F. | Vermont | 32 |
| Vagg, T. R. | Officedale | 45 |
| Wells, W. G. | Caldermeade | 65 |
| Woodyer, P. A. | Mornington | 19 |

In addition to the above-mentioned herds there are 816 commercial dairy herds containing 20,783 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they can not be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 443 herds in which 12,799 head of cattle have passed one test, and may be considered, therefore, to be in process of becoming tubercle-free herds.

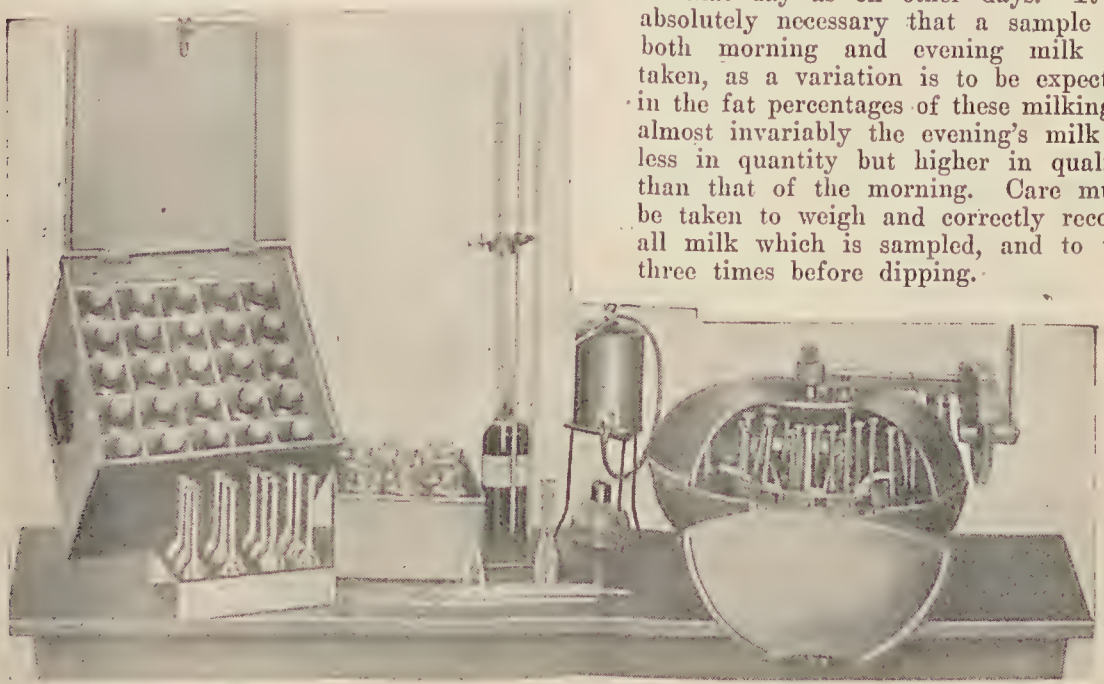
# MILK TESTING BY THE BABCOCK METHOD

By J. M. KERR, Former Superintendent of Dairying

THE usual method of ascertaining the percentage of butter-fat contained in a sample of milk is by means of the Babcock tester—so called from its inventor, Dr. Babcock, an American chemist. The principle of the tester is the same as that of the cream separator, the lighter fat globules being separated from the other constituents by centrifugal force. To facilitate separation and measuring of the fat in the test flask, a quantity of sulphuric acid is added to the sample. This entirely dissolves most of the solids except the fat, thus permitting its freer segregation. Further, the acid darkens all parts of the milk except the fat, so that when the sample bottle is whirled in the centrifugal apparatus, and the fat is brought into the long graduated neck of the flask the percentage can be read off easily.

The importance of seeing that every sample is truly representative of the milk from which it is taken cannot be too strongly stressed. The milk must be thoroughly agitated before a sample is obtained. If it has been standing some time, and the cream has risen and set, the milk should be re-warmed before any attempt is made to mix it. The actual testing is described later.

Where the object of a testing is to learn, from one day's yield, a cow's butter-fat capacity over a several-day period (as is done in herd testing), it is essential that the sample be typical of the milk yielded in an even 24 hours, and in a 24 hours when the times of milking were the usual ones. Further, the cow must be milked out to the same degree on that day as on other days. It is absolutely necessary that a sample of both morning and evening milk be taken, as a variation is to be expected in the fat percentages of these milkings; almost invariably the evening's milk is less in quantity but higher in quality than that of the morning. Care must be taken to weigh and correctly record all milk which is sampled, and to tip three times before dipping.



The complete outfit necessary to carry out the Babcock test.

The making of an independent test of each of the two milkings is the simpler method, but of course this means that there will be twice the samples to be put through the centrifuge. Sampling will then consist of—(1) marking the bottle with the cow's name or a distinguishing number; (2) weighing the milk yield; (3) recording the milk weight; (4) agitating the milk; and (5) dipping the sample—a few ounces—promptly from the bucket to the sample bottle. A 3-oz. vaseline bottle makes a most convienient sample bottle; if it is only half filled the mixing, later for pipetting, will be made easier.

If it is desired to make only one centrifuging operation for both the morning and evening milkings, sampling must be done on the composite principle. In composite sampling, the same sample bottle is used for each of the two samples, but it is necessary to secure them in the correct proportions. This can be done by having a straight-sided bucket to hold the milk and filling a sampling tube according to the depth of milk in the bucket. If a plain tube be inserted perpendicularly to the bottom of the bucket it will fill to the height of the milk, and then by pressing one's finger on the top and holding it tightly there, the contents of the tube can be lifted for transfer to the sample-bottle.

The method of obtaining a composite sample adopted by the Herd Testing Associations in Victoria is by means of a pipette graduated into cubic centimetres, a certain number of centimetres being taken for every pound of milk. It does not matter what number is taken so long as the same rate is observed at both milkings. It is always well, however, to have some sample milk available in case of a mishap during testing. A good working rule is—

| | |
|---|---|
| For cows giving over 20 lb. daily .. .. .. | 2 c.c. per lb. |
| For cows giving between 15 and 20 lb. daily .. .. | 3 c.c. per lb. |
| For cows giving between 10 and 15 lb. daily .. .. | 4 c.c. per lb. |

What must be particularly remembered is the number of centimetres per lb. taken from the milk of a cow at the first sampling, so that an equal number per lb. may be secured at the second sampling. If this rule be strictly observed, the mixture of the two samples will be essentially of the same composition as the cow's whole daily yield would be if her two milkings were mixed, no matter how different one may be from the other in test or in quantity.

Composite sampling, though entailing more thought and care in collecting, means a reduction in the number of samples to one-half those necessary if a sample from each milking be tested. The saving of labour will be considerable in those cases where independent testing of the morning and the evening milk would provide more samples than the centrifuging machine is capable of holding at one time.

The actual work of testing is performed in exactly the same way, whether the samples are composite or single.

If the test cannot be made before the milk is likely to sour, formalin—one drop to each ounce of milk—may be used as a preservative.

The various requirements, &c., in the work of testing may be set out briefly as follows:—

A firm, clean table or bench is essential, and a supply of hot water should always be at hand. The centrifuge is fixed firmly on the bench ready for turning, and should be well oiled. On the table are set out the milk samples; a shallow tray, 3 or 4 inches deep; a small water bath, 8 or 9 inches deep; and the glassware, which consists of a 17.6 c.c. pipette, one test flask for each sample, the acid measure (17.5 c.c.), a bottle of sulphuric acid of 1.827 specific gravity and between 60 and 70°F., a Fahrenheit thermometer with a range extending up to boiling point, and a pair of small dividers (for reading the test figure.)

Half-fill the shallow tray with water at about 108°F., and, making sure of the fastness of the identification markings on the sample bottles, set them in the tray to warm. Mark the test flasks (on the sand-blasted spot) for subsequent identification, setting them out in a handy position, and in order, on the table with the pipette ready for use. Lift each sample bottle in turn from the warming water, and shake gently to mix the contents thoroughly, but without buttering. The shaken samples in the shallow tray are then placed in cold water, and the contents cooled to about 70°F. before pipetting. The acid should be brought to a similar temperature also by standing the bottle in water. *Be careful never to add water to sulphuric acid; this is a dangerous practice.*

When the temperature of the milk has come down to about 70°F., pipette 17.6 c.c. of it from the sample bottle to the test flask. To do this correctly, shake the sample bottle gently to mix the milk constituents thoroughly, and, quickly inserting the pipette, draw the milk up

to near the top. Then slipping the forefinger between the lips to the top of the pipette, catch and hold the milk above the line. Hold the pipette up perpendicularly and on a level with the eyes. Gradually lighten the pressure of the forefinger, releasing the milk very slowly from the pipette to the line level and taking care to arrest its excessive drop by renewing the finger pressure in time. Should any fumbling occur in catching with the forefingers the bottle must be reshaken and the sample completely redrawn.

Transfer this measured pipette of milk into its correspondingly marked test flask, being careful not to spill any in the process. When using the thick type of pipette, only the tip of which can be inserted, it is best to hold the flask on a slant, thus giving freer exit to the escaping air and obviating splashing. The thinner and more modern type of pipette may be set in the flask right up to the bulb, and requires no further control in the releasing. Blow the last few drops out of the pipette into the test flask, but do not blow through the pipette into the milk when pipetting, as this causes froth, and is apt to affect the correctness of the measure. Similarly transfer milk from each sample to its correspondingly marked test flask, and set each flask, as it is filled, to the right of the previous one; all the flasks will then stand in regular order from the left when filling is completed.

Measure out the prescribed 17.5 c.c.'s of acid, and, holding the flask on the slant by the neck with the thumb and forefinger, carefully and slowly pour the acid into the flask, rolling the flask between the thumb and forefinger while doing so. In this way the acid washes all the milk out of the neck. Holding the flask by the neck, shake with a gentle rotary motion to thoroughly mix, taking care that none of the curdled milk gets into the neck, where it might escape the acid's action and give trouble later. Rotating may cease when the darkening of the contents becomes uniform throughout—a matter of one quarter of a minute or so. All the samples having been treated in the manner suggested they are now ready for contrifuging.

Place the flasks in the machine, preferably observing the same order of position as that followed throughout the process. If the machine is designed for a greater number of flasks than that being used, care must be taken to see that balance is preserved in placing them, as the machine turns at a great speed, and lack of balance is dangerous. Turn the handle the correct speed for the particular machine, this usually being indicated on it, and maintain that speed for five minutes. Allow the centrifuge to slow down (never stop it suddenly), then pipette into each flask enough clean hot water to bring the level just up to the neck. It is important that the water used for this purpose be free from minerals; it should never be at a temperature less than 180°F., and in cold weather almost boiling.

Centrifuge for another two minutes, then add more hot water to float the fat column into the graduated neck of the flask. Care is necessary when introducing this last amount of water because very little will cause it to overflow from the narrow neck. Centrifuge finally for one minute, and while the machine is slowing down prepare a water bath in which to stand the flasks in order to prevent the fat column from shrinking. The water must be near a temperature of 140°F. (never more), and while sufficiently deep to fully cover the fat column, yet not deep enough to risk the water entering the mouth of any flask. Transfer each flask from the centrifuge to the prepared bath. If many bottles are being used, the possibility of their raising the level of the water sufficiently to overflow the necks must be guarded against.

Everything is now ready for the entering up of the butter-fat percentages. Commencing with No. 1 sample, and holding the flask upright, place the dividers against the neck, adjusting the two metal points to the utmost top and utmost bottom of the fat column. Having obtained the correct spacing, remove the dividers and place the lower point on the nought mark of the graduations. Read off the figure corresponding to the upper point of the dividers, and this will give the butter-fat percentage or the number of pounds of butter-fat contained in 100 lb. of milk. This figure is commonly referred to as the "test." Enter up each test on the record sheet as it is read, making sure that each cow gets its correct figure. All readings should be made smartly, and immediately after the flask is lifted from the bath, because the contents always shrink with cooling, and delay means faulty reading.

To find the total amount of butter-fat which any given weight of milk contains, multiply the pounds of milk by its test, and divide by 100. *Example*—35 lb. of milk at 4.2 test = $35 \times 4.2 \div 100 = 1.47$ lb. butter-fat.

Some extra points to be remembered by all testers of milk are that sulphuric acid must be handled very carefully, as it will ruin any fabric which it touches, and will burn flesh severely. Never, by any chance, should the risk be taken of sucking it into the pipette with the mouth. If a thermometer or any other glassware is used for acid, it always should be rinsed immediately afterwards so as to avoid the chance of a curdled sample by its inadvertent use later. Though the flask must be held sloppingly when introducing the acid, it must be held quite upright when measuring the fat column with the dividers. Pipettes, or any similar circular glassware apt to roll, should never be left loosely on the table during centrifuging; the vibration is almost certain to shift their position and may cause breakage.

### *Summary of Order of Procedure*

1. Bring sample to 105° F.
2. Bring sample to 70°F.
3. Bring acid to 70°F.
4. Pipette milk from sample bottle into flask.
5. Measure acid and pour into the milk in flask.
6. Agitate flask to mix acid and milk.
7. Place flask in centrifuge.
8. Turn centrifuge for five minutes.
9. Remove flask from centrifuge and add hot water up to bottom of neck.
10. Return flask to centrifuge and turn for two minutes.
11. Again remove flask from centrifuge and introduce hot water (this time very carefully) to float the fat column up into the straight portion of the neck.
12. Again return flask to centrifuge and turn for one minute.
13. Remove flask from centrifuge and stand in water of 140° F. (Water should cover the fat column).
14. Read the fat column by measuring with dividers.

### *To Ascertain How Fast to Turn the Centrifuge*

Turning the centrifuge too fast is dangerous. Turning too slowly will fail to separate the fat. The right speed of turning the handle will vary with the diameter of the circle performed by the flasks; therefore, the bigger the diameter of the machine the slower the flasks need to revolve. Farrington and Wall, in their book on testing, have set down the number of revolutions (per minute) according to the diameter of the circulating disc, as follows :—

| Diameter of Circle of Rotation (measured from Centre Point of Flask Holders at Rest). | Number of Revolutions of Flask per minute. |
|---|---|
| 10 inches .. .. .. | 1,074 |
| 12 ,, .. .. .. | 980 |
| 14 ,, .. .. .. | 909 |
| 16 ,, .. .. .. | 848 |
| 18 ,, .. .. .. | 800 |
| 20 ,, .. .. .. | 759 |
| 22 ,, .. .. .. | 724 |
| 24 ,, .. .. .. | 693 |

To ascertain the number of turns of the handle that a given number of machine revolutions will require, proceed as follows:—

With the handle in a definite position (say at the highest point of its course) place a finger of the free hand in a flask socket. Then turn the handle very slowly, counting, at the same time, the number of times the finger comes around to its original position during one complete turn of the handle. Having discovered the number of turns made by the centrifuge during one complete turn of the handle, it is easy to find how many handle-turns will give the revolutions shown as correct for that particular diameter. Dividing the number of revolutions, given by one handle-turn, into the number required gives the correct handle speed per minute.

# POULTRY LAYING NESTS

By MARTIN D. HALL, Assistant Poultry Expert

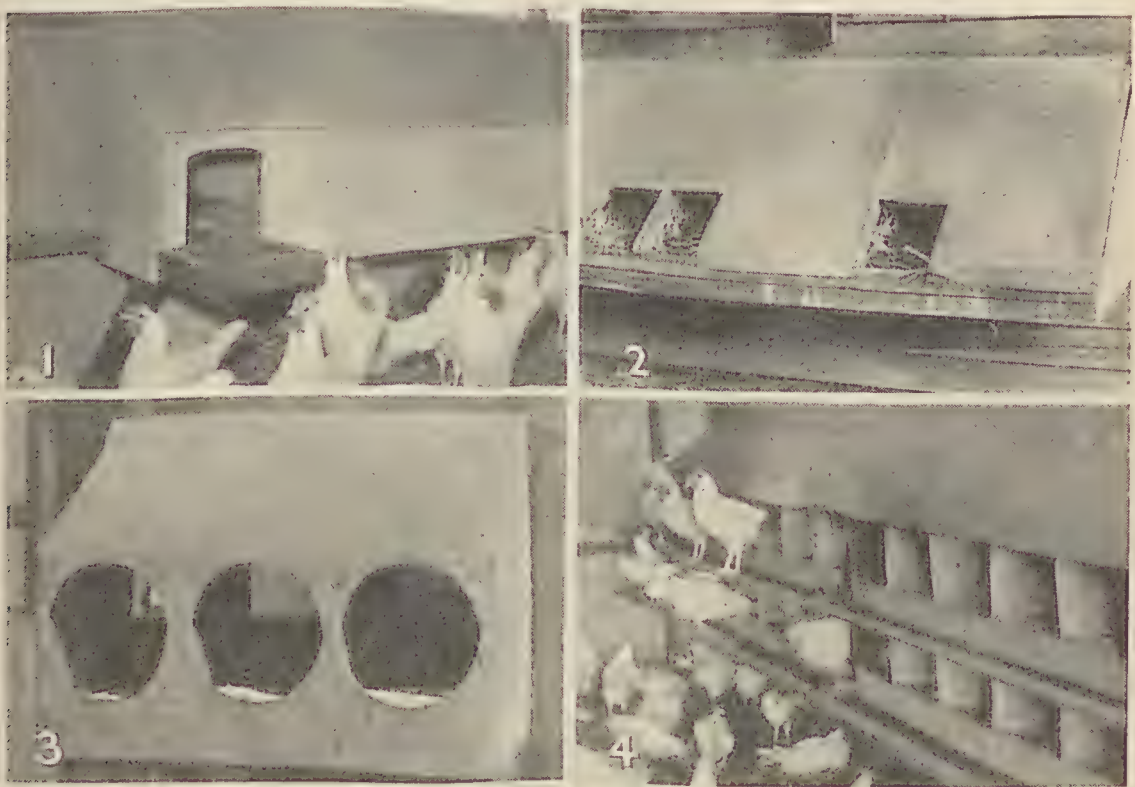
NESTING comfort for poultry embraces seclusion and quiet, cleanliness, freshness, attractiveness and ample room in the nest for free movement.

Nests should be simple in design and easily constructed. The system of providing a number of single nests in one group, made from kerosene tins or galvanized iron, is still popular. These nests give quite satisfactory service and are easy to build.

The nests should be of sufficient depth to provide protection, and a certain amount of seclusion while the birds are laying. Shallow nests cause restlessness and fighting among the layers and often encourage vices such as vent picking, cannibalism and feather picking. Shallow nests cannot hold sufficient nesting material and sometimes the birds scratch out the little that is there, causing breakages and other injuries to the eggs. Some birds spend a great deal of time climbing in and out, or around the nests and if the nests are shallow they walk over the backs of the layers, causing restlessness and a decrease in egg-production.

The nest is the receptacle in which the finished produce of the poultry farm is deposited, and it is only commonsense to make every effort to ensure that this produce is collected in a condition as nearly perfect as possible.

Figure 1 illustrates two different systems of almost similar construction. The nest "a" has a passage along the back, the floor being covered with wire. The nesting section is continuous (not partitioned off into separate nests).




Four types of nests. Details of construction are given in figures 1 to 4. No. 1 nest (above) varies slightly from the plan Fig. 1 (a) (page 118), the step being placed in front, instead of at the end. This placing is optional.

Type "b" has an opening at one end only, for the birds to enter, and the whole floor area inside is used for nesting purposes. The floors in both "a" and "b" should be covered with four inches of nesting material, preferably rice hulls. The opening in type "b" should be close to and face towards a wall, as one of the principal objects with community nests is to keep them as dark as possible inside. This has an attraction for the bird when it wants to lay, and it also discourages them from scratching around in the nest before or after the egg has been laid.

Figure 2 shows a rather unusual design, and it is similar in principle to the community nests in Figure 1. It is built on to the sectional partition wall and the birds jump right on to the edge of the opening where they enter and leave the nest. The bottom consists of a wooden frame to which 1-inch-mesh wirenetting is fixed. This is covered with a few inches of straw, the idea being to allow a circulation of air through the nest. The straw has to be replenished at regular intervals, as it tends to fall through the bottom of the nest. This straw is not wasted as it mixes with the litter on the floor of the pen.

Figure 3 shows a simple unit consisting of three separate nesting compartments. It is made from a sheet of galvanized iron, 3-ft. wide, and is bent into the shape illustrated.

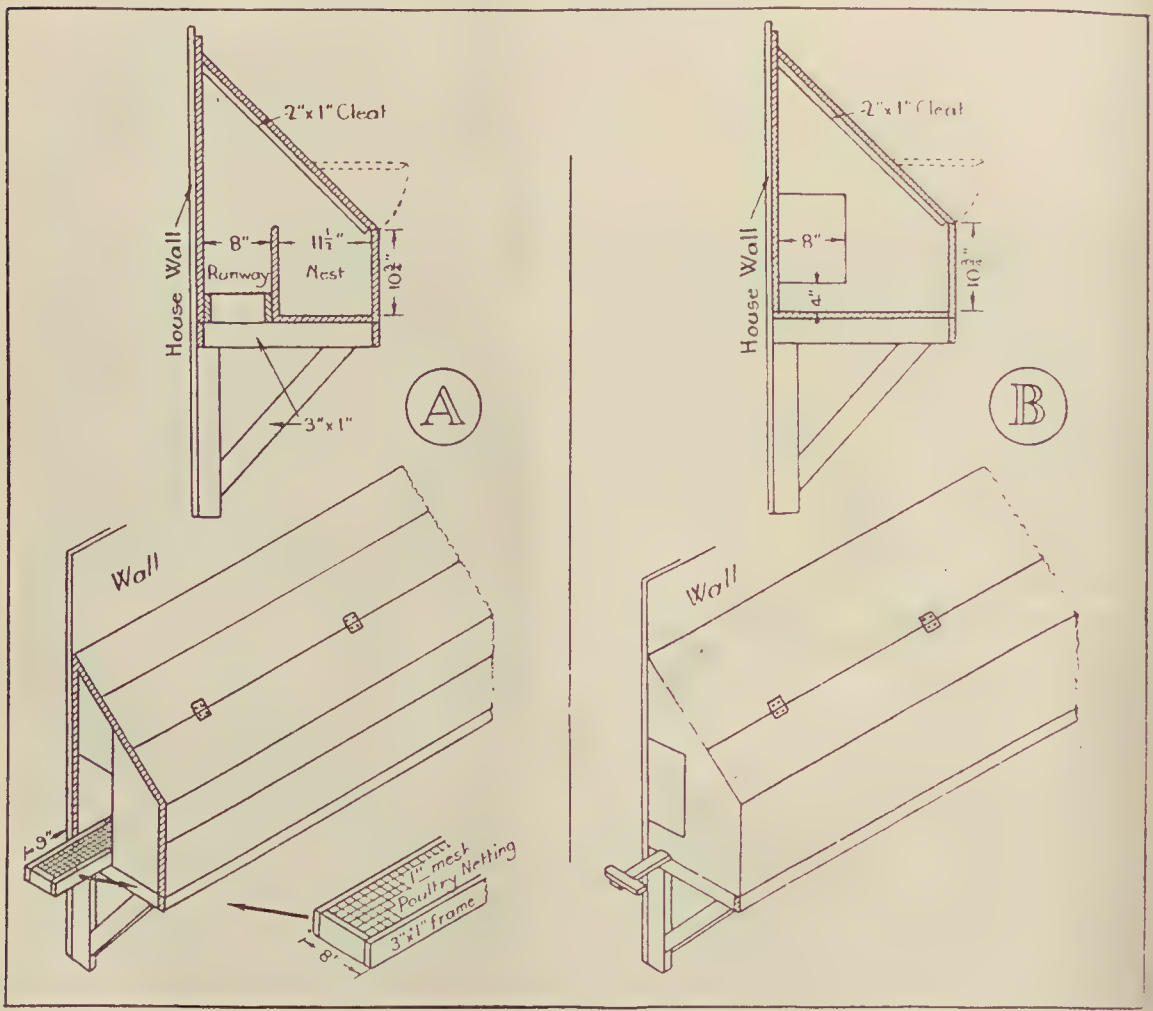



Fig. 1—Community type nests. (A) In this type the nests are entered from the passageway indicated. (B) A similar design without the passageway. The whole floor area is used for nesting.

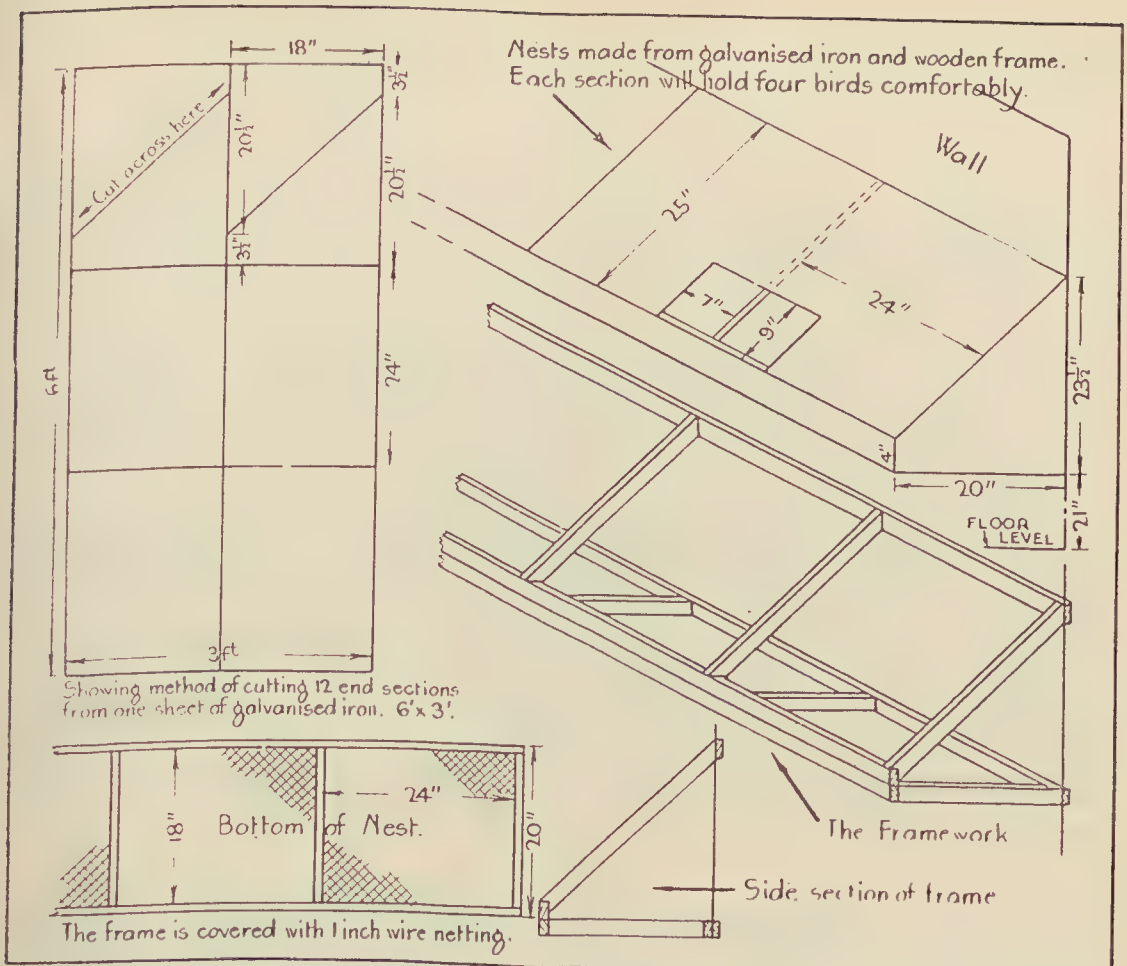



Fig. 2.—Plan of nest illustrated on page 117 (No. 2). The chief virtue of this nest is that it gives protection and seclusion to the layer.

The method of construction is to first bend the galvanized sheet into the required shape, and then mark the position of the round openings and cut them out. From another sheet of iron, cut the side and partition pieces, then rivet or solder them into their respective positions. The nest is placed on a wooden frame which is built on to the side wall or sectional partition of the laying house, approximately thirty inches above the ground.

Figure 4 illustrates a type of nest widely used by commercial poultry-farmers. This nest is built into the sectional partitions of the laying houses, either in single rows or in tiers. Steps are sometimes built on to the front of the nests, and in this case they have a dual purpose, for they are hinged and may be closed at night to prevent the birds from roosting in the nests.

Figure 5 shows a number of kerosene tins with one side of each tin cut out. The tins are grouped together on a wooden frame. This type of nest has been in use for many years. There is no step. This has been omitted purposely, to provide the layers with the maximum amount of protection, as other birds are tempted to walk along the step and disturb the laying birds. Sometimes these intruders pick the layers, and this habit may develop into the vices previously mentioned.

The drawings and photographs reproduced in this article are of the more widely used types of nests, and are more or less self-explanatory.

There are three main kinds of nesting material used on commercial poultry farms in Victoria, mainly, rice hulls, straw and shell grit.

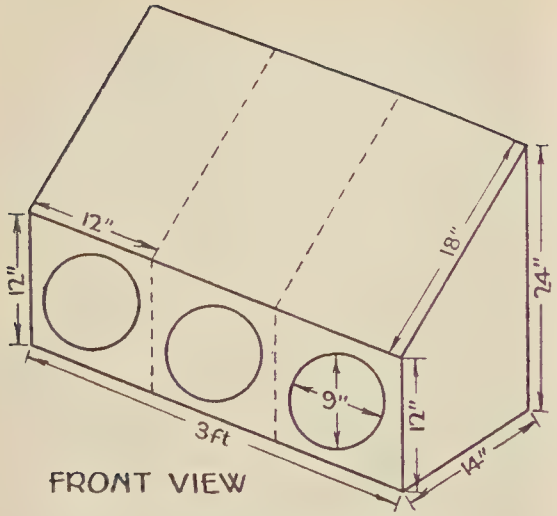



Fig. 3—A simply-constructed single-unit nest. (No. 3, page 117.)

Much wastage due to dirty, cracked, broken and heat-affected eggs, and egg-eating, is the result of poor nesting accommodation. If this wastage could be measured it is quite possible that the amount of money lost would be more than sufficient to pay for the installation of better nests.

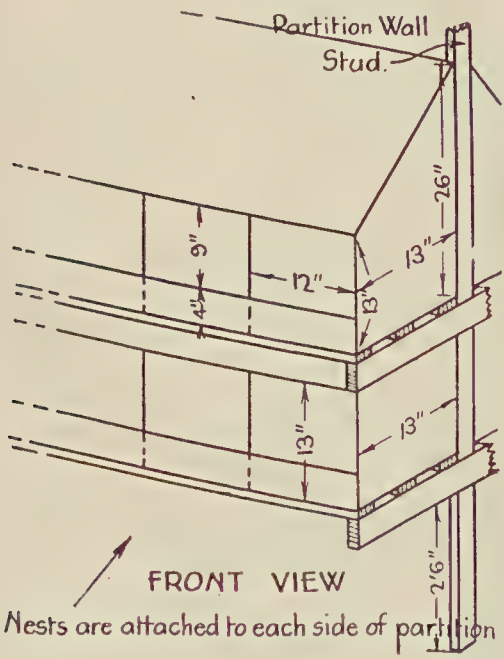



Fig. 4—A popular type of nest used on many commercial farms. (No. 4, page 117.)

Clean, roomy, secluded nests produce clean eggs. Small, dirty, open nests produce many dirty and broken eggs.

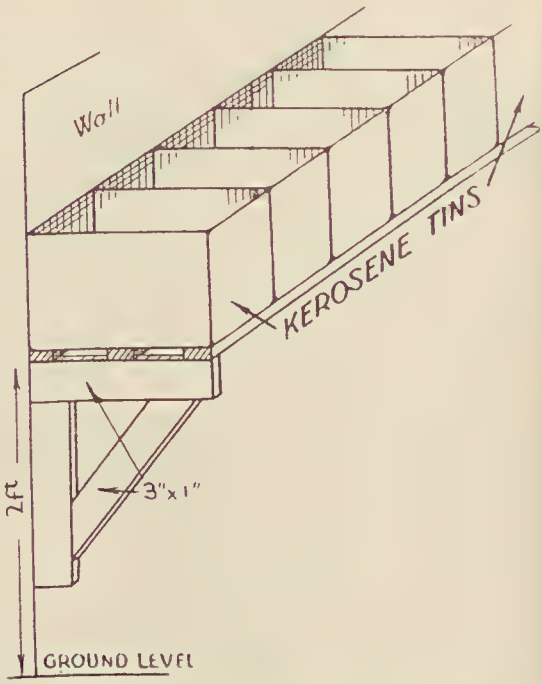



Fig. 5—Kerosene-tin nests are still used extensively on Victorian poultry farms.

Trap-door for collecting eggs from community-type nest (Fig. 1).

Eggs are a valuable food and are urgently needed for the fighting services, the civil population and for overseas. It is essential therefore that every possible effort be made to prevent waste.

# The Cleaning of Milking Machines

Contributed by Officers of the Dairying Division

A satisfactory type of milking shed open to the sunlight.

MILKING machines, perhaps more than any other dairy equipment, require thorough cleansing. In careful hands the machines give excellent results, but if subjected to careless and improper treatment they become a menace in the production of milk and cream.

The over-enthusiastic salesman may be responsible, to some extent, for the false impression that the washing of any particular type of machine is a simple matter. All that is required, he may claim, is the sucking of a little water through the system after the milking has been completed. Purchasers of milking plants must understand that this is not sufficient however, and that efficient and satisfactory results will be obtained only by careful handling, thorough washing, cleansing and sterilizing of the entire machine units.

On all dairy farms, whether machines are used or not, it is essential that there should be some satisfactory appliance for heating water, the ideal being a steam boiler or other system from which steam can be obtained under some degree of pressure. Other necessary appointments consist of a plentiful supply of washing or caustic soda, brushes and a double trough, one section to contain warm water and washing soda for the washing, and the other to contain the very hot water necessary for the scalding (by protracted immersion). A steam pipe will be necessary to heat this water. The equipment is all the better for a steam jet also.

All utensils which come in contact with milk or cream become greasy. By the use of soda and boiling water, the fat is acted on in such a way that its complete removal is a comparatively easy matter. Soda has certain antiseptic properties also, but it must be remembered that it cannot take the place of boiling water.

Caustic soda is more powerful in its action than washing soda, and the use of too strong a solution must be guarded against—one tablespoon of the caustic form to one kerosene tin (four gallons) of water, or one teaspoonful to one gallon is as strong a solution as one dare use, especially in view of the fact that the treatment here described involves the

Fig. 1—Scored inner surface of twelve months' old long milk-rubber, after cleaning daily with boiling water, washing soda, and the use of a brush and scraper.

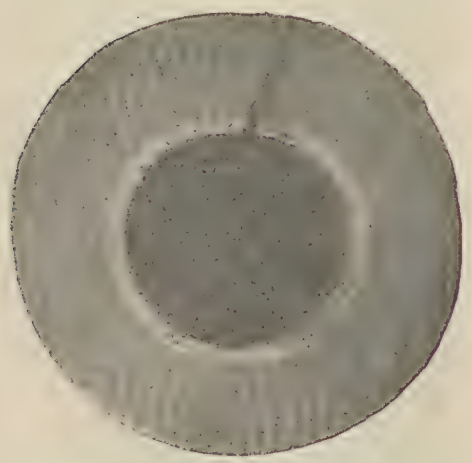


Fig. 2—End view of rubber shown in Fig. 1. The scored surface is indicated by the whitish inner circle.

cleansing of metal as well as rubber parts. Care must be taken to prevent the solution from lodging in the milk-holding vat. Further, the solution should not be allowed to stay in contact with the utensils for any length of time. After washing in the soda solution, all materials should be rinsed in boiling water, as the least trace of caustic solution will have a most harmful effect on milk or cream with which it may come in contact.

This treatment is in addition to that given the rubbers which should be dismantled for special and separate boiling treatment at least once a week. This will give an opportunity for the use of much stronger caustic treatment, the rubbers then being treated alone. For rubbers only, use at least a dessertspoonful of caustic soda to the gallon of water and actually *boil* the rubbers in it for at least ten minutes.

Fig. 3—Claw-like rubber, showing the effect of lodgment of grease.

The udders and teats of all milking cows should be washed carefully with a clean cloth in clean water, after which the milk from each teat should be examined carefully for any trace of mastitis. This is a most vital precaution as this disease can be transmitted rapidly to other cows in the herd by means of the teat cups. On no account should a diseased cow be milked by machine.

The operator must look to his personal cleanliness and also be alert at all times in case a unit should fall from the udder. If this does occur, the suction should be stopped immediately and the cups washed in clean warm water before they are returned to

the udder. If this practice is not adopted, it is possible that all the milk from that milking will be contaminated seriously from the floor dirt adhering to the teat cups.

Manure should never be left, even temporarily, on a cowshed floor where machines are in use, this being a common form of contamination. The handling of a dirty leg-rope after washing the hands, also may undo much careful work.

Fig. 4—Teat-cup soft inflation showing the effects of brushing after three months' use.

### *The Cleansing of Milking Machines in Position*

**Material and Appliances Required.**

1. An abundance of clean cold water.
2. Boiling water and steam.
3. Wash trough, scrub brushes, ball of horsehair or travelling brush, and caustic or washing soda.
4. Dairy thermometer registering at least 212 degrees Fahrenheit.

Fig.5 —A long milk-rubber after two seasons' use and cleaning daily with caustic soda and boiling water.

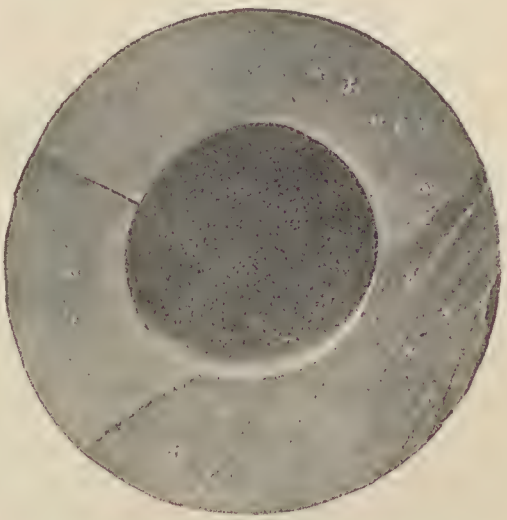


Fig. 6—End view of rubber shown in Fig. 5.

**Application of Method.**

1. After milking, draw cold or tepid water through the milk system to wash out all milk lines before applying heat.

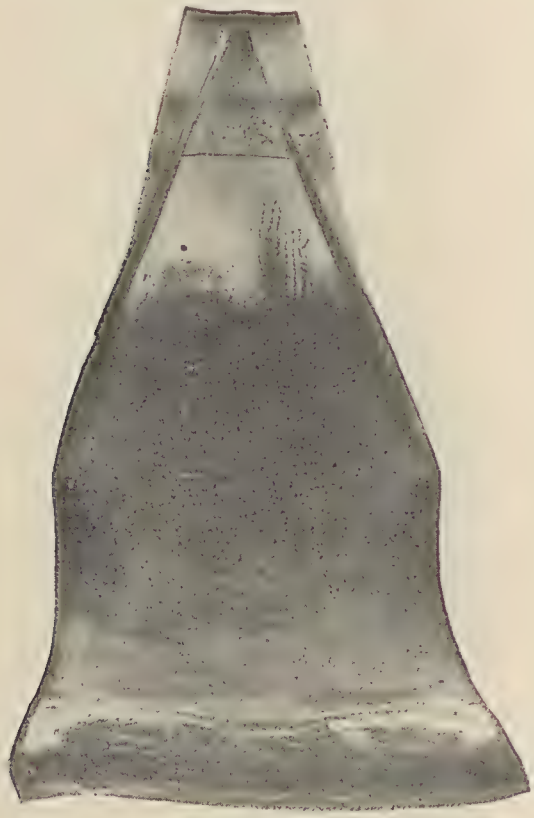


Fig. 7—Teat cup soft inflation after four months' use and cleaning by the recommended method.

2. Scrub off all dirt from the outside of the teat cups.

3. Put the releaser out of milking action by stopping the pulsator at a point that will cause the outside flap on the releaser to sit tight. Then draw through each set of teat cups at least one gallon of boiling caustic solution (strength of the solution one full tablespoon of caustic soda to four gallons of boiling water). On drawing it through the set furthermost from the releaser, carefully lift the flap or draw the plug of the end of the main milk pipe and insert a 6-inch length of plaited horsehair as a travelling brush, holding the same until the vacuum pressure again rises, and simultaneously remove the plug for a moment and allow the horsehair brush to whisk into the releaser. The releaser becomes full and the overflow travels into the vacuum tank. Next, place an empty bucket under the releaser, break the vacuum by removing the plug from the end of the milk pipe, allow the contents of the releaser to discharge into the bucket, then replace the pipe plug.

4. To remove all traces of the soda solution, immediately draw through each set of teat cups at least two gallons of boiling water. Both the soda solution and boiling water are applied with best results by dousing the teat cups in and out of the liquid. This causes an inrush of air and flushes the walls of the pipes. In addition, as a result of stopping the pulsator, the hot water is retained in the system, which is thereby heated to a higher temperature.

5. *Vacuum and air system.*—Detach the air-rubber tubing from each claw and place the ends in boiling caustic solution and draw at least two quarts through each, then rinse with clean boiling water. The water will pass through the tubing under the pulsator slide into the main vacuum pipe, and thence into the vacuum tank.

6. Next, detach the air-pipe from the rubber tube connecting it with the outer chamber of the releaser and draw through two quarts or more of boiling caustic solution, followed by some clean boiling water. These fluids will also travel to the vacuum tank.

7. The steam hose should be inserted and the pipes subjected to live steam for a few minutes.

8. Before stopping the machine, allow the teat cups to draw air for a few minutes, remove and

Fig. 8—A claw-tube rubber from the same machine as milk tube in Fig. 5.

replace the plug on the main line two or three times to cause an inrush of air to carry away all surface moisture, drying and sweetening the line.

9. Leave all taps and ends open to allow the free circulation of air.

10. Scald and scrub vacuum tank.

11. Dismantle releaser and scrub and scald.

The cleansing of machines in position does not obviate the necessity for the frequent dismantling of drop tubes, teat cups, and claws for manual cleaning; nor the need for cleansing immediately after milking twice daily.

### *Special Treatment for Rubbers*

The injurious effect of the fatty constituents of milk on rubber constitutes one of the problems in the care of machines, and constant attention to these parts is required. The following treatment at least once weekly is necessary:—All rubber portions (this includes inflation stoppers and releaser rubbers) should be taken off the machine and boiled in a caustic soda solution (two tablespoonfuls to four gallons of water). Care must be taken not to allow the rubber to come into contact with the hot metal while boiling. Place the rubbers in a sugar bag or a specially constructed perforated wooden box and after boiling for ten minutes transfer to pure boiling water to remove the caustic solution, and allow to cool down slowly. Only by such severe and separate treatment, regularly applied, can the rubber of milking machines be kept in a sanitary condition. A further advantage is that the treatment increases the life of the rubber parts.

The action of the strong soda solution on the inner surface of the rubbers is to entirely remove the absorbed milk fat and leave instead a glass-like surface. Fat is extremely damaging to rubber If the rubbers are not given the stronger and separate soda treatment once a week at least they will become spongy and form harbours for germs. Rubber tubing and teat inflations, if examined closely, may show otherwise unsuspected cracks and crevices. These will invariably hold dirt and be sources of infection.

The use of hard brushes or scrapers unless they are used very carefully is not recommended, as the inner surface of the rubber is apt to become scored and consequently will be harder to keep clean. The outside of the rubber as well as the inside should be cleansed and then placed in clean, airy surroundings. It is advisable to keep rubbers away from strong light.

Incidentally, the same drastic boiling in strong caustic soda is necessary for the rubber-washer ring of the separator bowl as well, and this should be included in the weekly boiling. Without regular treatment in hot caustic soda, the rubber ring of the separator will become a source of cream-spoiling germs.

Cold water sucked through the machines before commencement of the milking will result in the milk residue being less difficult to remove, but only the purest of water or water previously sterilized with sodium hypochlorite should be used for this purpose.

# *Certified Pullorum Tested Flocks*

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942, issue of the *Journal of Agriculture*.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

| Owner. | Number of Birds. | Owner. | Number of Birds. |
|---|---|---|---|
| Christie, R. R., and Son, Bentleigh .. .. | 829 | Ridgway, Geo., Callander-road, Noble Park .. .. | 196 |
| Davidson, Mrs. A., Sherbrooke-avenue, Ringwood .. | 107 | Salmond, J. B., Deer Park .. .. .. | 153 |
| Greenshields, E. J., Lancefield .. .. .. | 669 | Shelford, D., Beaufort-road, Croydon .. .. | 141 |
| Lawrie, Mrs. M. J., 107 Albert-street, Sebastopol, Ballarat | 430 | Waldmann, F., Greythorne-road, North Balwyn .. | 936 |
| Ralph, W. R., Commercial-road, Lower Ferntree Gully | 107 | Yates, W., 64 Banks-street east, Ascot Vale .. | 30 |

# IN THE ORCHARD

## Harvesting and Cool Storage of the Jonathan Apple

Contributed by the Horticultural Division

DURING the month of March Jonathan is the main apple variety to be picked. This is the most popular of all dessert varieties and normally large quantities are cool-stored for marketing later in the year. The behaviour of the Jonathan in cool store has been the subject of detailed investigations over several years, and the conditions under which it should be harvested and stored in order to reduce losses to a minimum are now fairly well known. Briefly, these are summarized as follows:—

(*a*) Harvest at the correct time;

(*b*) store at the correct temperatures.

### *Picking Maturity*

The apple is a living piece of plant life, even when it is removed from the tree, and processes of breathing and using of energy proceed normally. At ordinary temperatures an apple picked slightly before maturity quickly reaches a stage of maximum juiciness and ripeness, after which it rapidly loses moisture and flavour. Storage at a low temperature has the effect of considerably slowing down this process. An apple picked too early never develops full flavour in cool store and wilts badly. Apples past the peak of maturity, although of good flavour when picked, rapidly deteriorate in cool store and wastage due to various disorders, particularly breakdown, is considerably increased. The tendency to pick Jonathans at an over mature stage is frequently due to a desire to obtain a bigger percentage of red colour in the skin. However, the amount of red colour in the skin is not a measure of maturity. This is indicated by the ground colour, or the colour of the skin where blush has not developed. For best results, this should be just changing from green to yellowish green. Apples picked at this stage will reach full flavour and juiciness in cool store and wastage will be at a minimum. Colour charts indicating the correct picking stage are available on application to this Department. As it may not be possible to closely adhere to this standard, particularly on a large property, it is advisable to remove from the cool store first the fruit which was harvested latest.

### *Storage Temperatures*

Jonathan apples stored at 32°F. are subject to wastage from soft scald and breakdown while losses due to the development of mould and Jonathan Spot are increased at temperatures from 34°—36°F. A method of temperature control has been adopted for Jonathans whereby the chambers are held at 36° until the end of April, 34° until the end of May and thereafter at 32°F. This technique also suits the Delicious variety and most cool stores have separate chambers set aside for these two varieties in order that they may be held at these temperatures.

### *Large Fruit*

Because of the light crop this year, it is possible that growers will have a large percentage of apples up to three inches and over in diameter. This fruit does not store well, as it is subject to breakdown. Storage at the temperatures 40°—36°—32° would lessen this loss, but would increase the tendency for Jonathan Spot to occur after two or three months in store. It is recommended that if large-sized Jonathans cannot be disposed of immediately, they should not be held in store after the end of June.

### *Gas Storage*

In recent years, cool-storage of apples in gas-tight chambers with controlled ventilation, so that the percentage of carbon dioxide is maintained at 5 per cent., has met with outstanding success. Jonathan apples stored by this method examined at the end of January last were juicy and of excellent flavour. Other varieties had also kept in excellent condition. All varieties kept in gas storage must be packed in oil wraps to prevent superficial scald, a disorder which does not develop in Jonathans in air storage. Because of the maintenance of humidity within the gas chambers, shrivelling and loss of flavour is reduced to a minimum. Under ordinary cool storage, Jonathans kept

[*Continued on page* 130.

# The Control of Botrytis Corm Rot of the Gladiolus

By G. C. WADE, B.Agr.Sc., Assistant Plant Pathologist, Biological Branch

BOTRYTIS corm rot of the gladiolus was first recorded in Victoria in 1940, the specimens having been submitted by a grower at Kalorama. It has subsequently been found on corms from other parts of the Dandenong ranges, the metropolitan area of Melbourne, and at Geelong, Ballarat, and on the Mornington Peninsula. It has caused serious losses and some growers have lost over 50 per cent. of the corms of susceptible varieties, in seasons favourable to the disease. The disease also occurs in the coastal districts of New South Wales (correspondence with Drs. Magee and L. Fraser, New South Wales Department of Agriculture), and in Tasmania (correspondence with Mr. N. H. White, Tasmanian Department of Agriculture). A full account of the investigations, on which this article is based, will be published in the Proceedings of the Royal Society of Victoria.

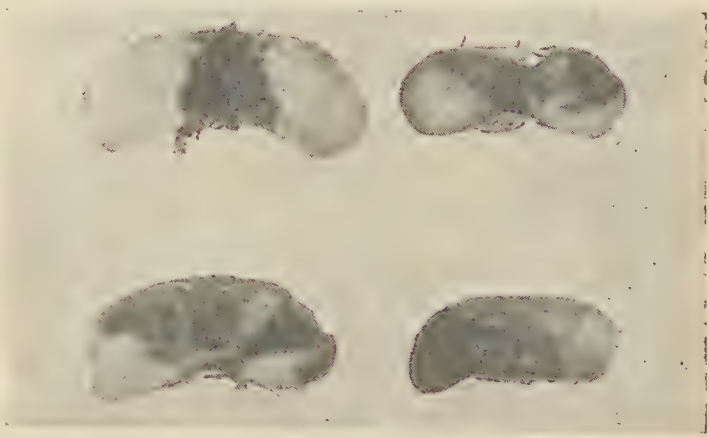


Fig. 1—Progressive stages in infection with botrytis.

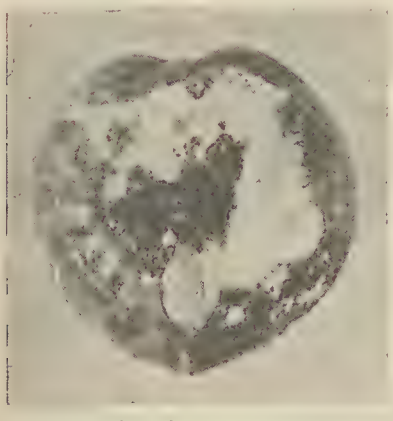


Fig. 2—Infected corm. Note the white mycelium of the fungus and black resting bodies (sclerotes) at the centre of the corm.

*Botrytis* corm rot was first described in Canada in 1927 (1), and it is also present in Holland (3), Great Britain (4), and the United States of America (2).

### *Symptoms of the Disease*

The fungus which causes this disease attacks all parts of the gladiolus plant, but from an economic point of view, the attack on the corm is the most serious aspect of the disease.

(*a*) **Corm Symptoms.**—Corms show several types of symptoms, but they are all successive stages in the development of the disease.

In the earliest stage only the core of the corm is affected. A close examination of the basal plate will show a brown discoloration, but infected corms can be readily overlooked at this stage. When the corm is cut the core region shows a brown rot condition (Figure 1).

In later stages of the disease, the rot travels along the water-conducting vessels, and when it reaches the surface the rot spreads rapidly. Severely infected corms may be entirely reduced to a soft, rotten mass. The condition

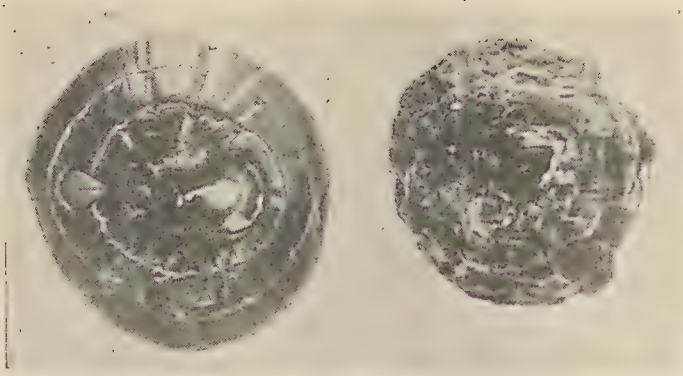


Fig. 3—Left—A slightly infected corm. Right—A corm in the mummified condition.

of the corm may not be obvious until the corm scales are removed, although the corm will feel very soft when squeezed.

If the corms are held under moist conditions the fungus, which is the cause of the disease, will grow on the surface of the corm. The fungus appears like white cottonwool, and it develops round, black bodies about $\frac{1}{8}$ to $\frac{1}{4}$ inch in diameter. These black bodies (sclerotes) are the resting stage of the fungus, and the fungus is carried over from one season to another by these resting bodies (Figure 2).

The infected corms later dry out to a mummified condition, illustrated in Figure 3.

The disease may be distinguished from the other diseases of gladiolus corms, which occur in Victoria, by cutting a section through an infected corm. If the disease present is *Botrytis* the interior of the corm, including the core region, will show a brown rot. Other gladiolus corm diseases either do not penetrate very deeply into the corm, or do not usually involve the core region.

(*b*) **Leaf Symptoms.**—The leaves do not usually become infected until after flowering time. The fungus causes small dead areas, which typically have a reddish margin (Figure 4). When the spots are numerous, the whole leaf yellows and dies prematurely.

(*c*) **Flower Infection.**—The fungus attacks the flowers, causing water-soaked spots. These spots frequently coalesce, destroying the whole flower, and abundant grey spores (the "seeds" of the fungus) rapidly develop (Figure 5).

The direct loss, through destruction of blooms, may in itself be quite serious. The development of the spores is of great indirect importance, since these spores are the means whereby the corms become infected.

(*d*) **Collar Rot.**—The organism occasionally causes "collar rot" of the growing plant. The tissues of the collar region die, the leaves yellow and sclerotes develop on the collar region. This aspect of the disease is not important under Victorian conditions, and it can usually be traced to planting infected corms.

### *The Cause of the Disease*

The disease is caused by a fungal organism, known as *Botrytis*. The fungus has a vegetative stage consisting of a mass of white threads (the mycelium), which develops black resting bodies enabling the disease to be carried over from one season to another.

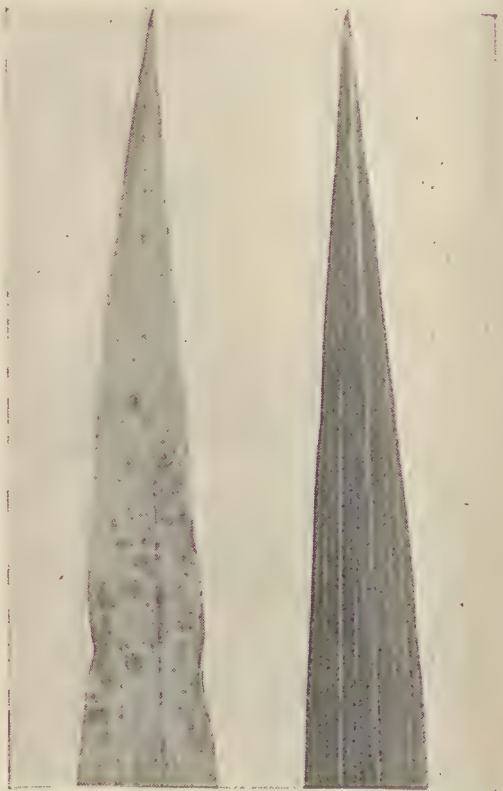


Fig. 4—Leaf infection. The leaf on the left was unsprayed, while that on the right was sprayed with 6 : 4 : 40 Bordeaux mixture.

It also has a fruiting stage, consisting of a branched structure on which the spores develop. This stage is grey in colour.

### Life History of the Fungus

The black resting bodies, which develop on the corm, germinate under certain conditions and produce the spores of the fungus (Figure 6). These spores are then carried by air currents, and may either infect the leaves or flowers of the gladiolus, or infect corms directly. If they infect flowers numerous spores are produced, so that the number of spores in the atmosphere rapidly increases.

After the corms are dug, the tops cut off, and the corms placed on the drying racks, spores may alight on the old corm or the cut stem end. These spores then germinate and the fungus enters the corms through the core, from which it spreads along the water conducting vessels, as described in a previous section.

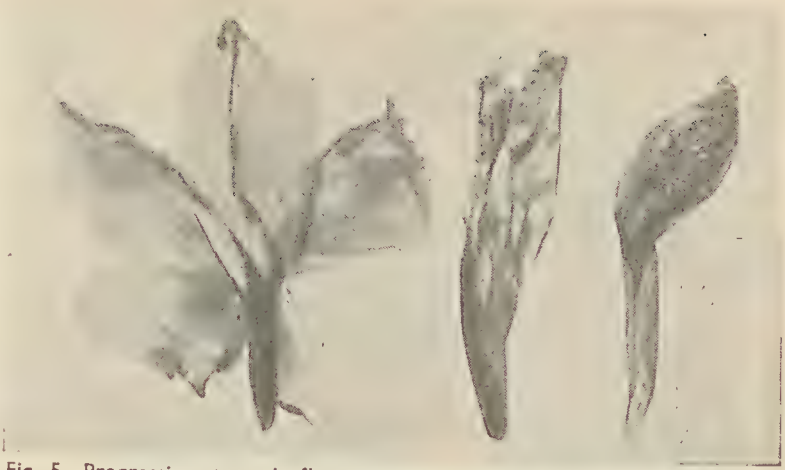


Fig. 5—Progressive stages in flower infection. Note the abundant spores on the flower at right.

## *Control*

(*a*) *Dipping.*—Since the fungus infects the interior of the corm, dips applied after the corms are infected will not control the disease, as the dip will not be able to penetrate into all the infected tissue. However, the corms may be protected from infection by dipping them, as soon after digging as possible, in one of the dipping solutions listed in Table 1. The corms must be washed thoroughly with a water spray before dipping. They should preferably be dipped in a muslin or cheesecloth bag.

All of the abovenamed materials will give some measure of control of the disease, but "Hortosan DP" gives better control than "Aretan" or corrosive sublimate. "Zetan" gives control of the same order as "Hortosan DP."

After immersion, the dipping solution should be drained off, and the corms spread out on well-ventilated drying racks. Wire-netting stretchers arranged in racks are suitable.

From an economic point of view it would be desirable to use the same solution for several batches of corms. However some loss of strength follows each dipping, and therefore the solution can be used for one batch of corms only, unless the strength of the solution is restored. Only limited experimental work has been conducted on this aspect of the problem and only tentative recommendations are possible at present.

Table 1.

| Fungicide. | Concentration. | Time of Dipping. |
|---|---|---|
| Mercuric chloride (corrosive sublimate) plus Agral II. | Cor. sublimate, 1 in 1,000; Agral II., 1 in 2,000 | Minutes. 2 |
| "Hortosan DP" .. | 2 oz. in 10 gallons | 15 |
| "Zetan" (synonymous with New Improved Semesan Bel.) | 1 lb. in 10 gallons | 15 |
| "Aretan" .. .. | 4 oz. in 10 gallons | 15 |

"Hortosan DP" may be restored to approximately its original strength by adding $\frac{1}{2}$ an ounce of "Hortosan DP" after dipping each batch of 500 corms in ten gallons of the solution for fifteen minutes. This cannot be accurate, since the amount of the active ingredient removed by the corms will vary with the size of the corms, and the amount of soil on the corms.

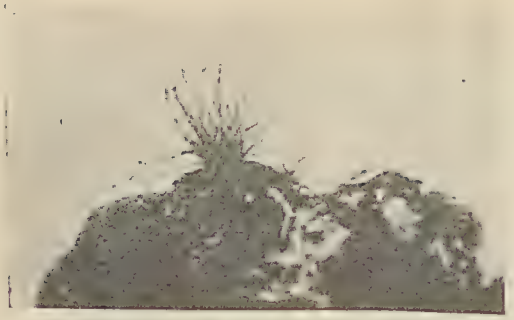


Fig. 6—A germinating resting body (Sclerote) Magnification 15 diameters.

According to the manufacturer's directions, "Zetan" may be used for successive batches of corms until the solution is reduced to two-thirds its original volume. This point was not checked experimentally in the investigation on this disease.

No tests were conducted on the depletion of the strength of "Aretan" or corrosive sublimate, by dipping successive batches of corms and no recommendations can be given for restoring the strength of these materials.

(*b*) *Infected corms* should be destroyed by burning or deep burial, in order to reduce the carry over of the disease.

(*c*) *Unwanted flowers* should not be left in the field, but should be cut and destroyed by burning or deep burial. This will reduce the number of spores of the fungus which develop.

(*d*) *Early Digging.*—The disease may be avoided by planting early, so that the corms may be dug early in the autumn. *Botrytis* is favoured by cool, moist conditions, and if the corms are dug early the conditions are unfavourable for infection. Under Kalorama conditions corms dug before the second week in March are unlikely to become infected.

(*e*) *Varietal Resistance.*—Certain varieties of gladiolus are resistant to the disease. Experiments which were conducted showed that Miss New Zealand, Pelegrina, and Red Lory are all resistant to the disease; Miss New Zealand being more resistant than the other two varieties.

According to growers' reports, King Lear, Elinora, Mrs. S. A. Errey, Black Opal, Champlain, Don Bradman, and Rose Dawn are also resistant. It is unnecessary to dip the corms of such resistant varieties.

(*f*) *Infection of the foliage* is not usually sufficiently serious to warrant special control measures, but it may be controlled by spraying at fortnightly intervals with 6:4:40 Bordeaux mixture, containing 1 part in 2,000 of Agral II. as a wetting agent. The first spray should be applied immediately after flowering.

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## ORCHARD NOTES—*continued from page 126.*

after September lack flavour and crispness, so that this method offers opportunity to provide high-quality fruit during the months October-December.

Due to the shortage of material to make chambers gas-tight, it is unlikely that gas storage will become widespread until after the war. Because of the uncertainty of export trade in apples in the immediate post-war period, this method of extension of the home marketing period offers great possibilities. For more detailed information on gas storage, readers are invited to write to the Director, Department of Agriculture, Melbourne, C.2.

#### Publications.

Departmental publications of interest to fruitgrowers include "Soil Survey of Part of Shepparton Irrigation District" by J. K. M. Skene and J. R. Freedman, and "A Progress Report on the Citrus Rootstock Trial at Irymple" by J. L. Provan and C. E. Cole. These publications are available free on application to the Director, Department of Agriculture, Melbourne, C.2.

# THE FLOWER GARDEN

By J. L. PROVAN, B.Agr.Sc.,
Principal, School of Horticulture,
Burnley Gardens

Cluster of flowers of Hoya Carnosa, the wax plant

ALTHOUGH the removal of the dead flowers from plants is time absorbing, the operation is well repaid because it means a longer flowering season. Most plants when they have set seed receive a check to their growth and this is thought to be due to the formation of hormones within the plant tissue. If the fading flowers are removed sufficiently early, this hormone production is checked and better quality flowers in larger quantities are obtained. The energy which the plant would normally expend on maturing seed is diverted to new growth and flower production. This is particularly noticeable in dahlias.

On the other hand if it is desired to obtain seed, it is a better practice to retain the mid-season flowers than to delay until the end of the season. Dahlias, zinnias, and other composites frequently produce mouldy seed-heads late in the season and the vitality of the seeds is affected. The seed-heads produced during the earlier part of the season are better nourished and may be harvested and dried without the incidence of mould.

On a plant like the dahlia it is only necessary to obtain several seed heads in order to retain quite a number of seeds, and consequently all the superfluous seed heads can be removed. Raising dahlias from seed is a fascinating occupation and the results are always sufficiently interesting to encourage the home gardener to continue from year to year in the hope of raising an outstanding new variety.

### *Mildew*

The mild weather conditions which are experienced this month, together with the dews at night, favour the development of mildew on many garden plants. There are many forms of mildew, but essentially they are fungous diseases which live on the surface of the leaf and obtain nourishment from the leaf, at the same time causing a smothering effect due to the strands of the fungus spreading over the leaf surface.

Roses and delphiniums are particularly susceptible to mildew infection. As soon as the first signs of the condition, which takes the form of a dust-like powder over the leaves, are seen, dust the plants with flowers of sulphur, which can be obtained from the grocer, or spray with a spray containing sulphur. Dusting is best done on a bright sunny day. The warm temperatures assist in the control of the disease because the sulphur is readily changed into gas.

### *Gladioli*

Gladioli corms should be lifted about six weeks after flowering. It is not advisable to leave the corms in the ground from season to season. If this is done a large number may be lost by rot.

After lifting the plants, the tops may be cut off about 6 inches above the corms and then the corms should be stored in a cool,

airy shed to dry. When dry, they may be cleaned and dusted with naphthalene flakes to prevent aphis infection.

### *The Wax Plant*

The wax plant is a very attractive climber, and is sometimes called the Climbing Wax Flower. Its botanical name is *Hoya carnosa* and it is a native of Eastern Asia and Northern Australia.

It has thick, dark, glossy, green leaves and is quite a vigorous-growing plant if given the right situation and soil conditions. The young growth is of a bronze colour and is very tender. The pink, wheel-shaped flowers are borne in clusters in the axils of the leaves during summer. These flowers are produced on club-like spurs, and it is necessary that the spur should be retained on the plant because it will bear flowers again next season. If the spur is removed no more flowers will be produced at this point.

One of the best positions for this plant is under the eaves of a house on a wall facing the east, or under a light verandah, either growing in the garden bed or in pots or tubs. In Victoria the plant requires shelter from the very hot sun of summer and also from frost in winter.

The soil should be a medium to a heavy loam and contain plenty of old leaf-mould and some limestone rubble. During the winter the soil should be kept fairly dry because then the plant is resting, but in spring and early summer watering should commence if the situation is dry, and weak liquid manure can be applied at intervals of two or three weeks.

The plant is not difficult to propagate as it strikes rather readily from cuttings taken in the spring, or it can be layered.

## *THE VEGETABLE GARDEN*

### *Cabbage*

Plants of *East Ham* and *Savoy* cabbage can be transplanted this month into thoroughly prepared beds. Space the plants about 2 feet apart each way and protect them from the cabbage white butterfly and cabbage moth by a dust containing arsenate of lead powder.

### *Cauliflower*

Plant out *Phenomenal Maincrop* cauliflower, spacing the plants 3 feet apart between the rows and 2 ft. 6 in. in the rows. The same protection against insects will be required as for the cabbage plants.

A cluster of flower buds of the wax plant.

### *Spinach*

Seed of *Prickly Seeded* spinach can be sown in drills in permanent beds. Space the drills 12 to 18 inches apart and cover the seed to a depth of about ½ an inch. Later, thin out to 4 to 6 inches apart. Spinach requires rich soil and should be grown quickly.

### *Silver Beet*

A sowing of silver beet can be made now, or plants may be transplanted. The three principal varieties being grown are *Fordhook Giant, Dark Green Broad-ribbed,* and *Lucullus.* Space the rows 2 feet apart and allow about 12 inches between the plants. If seed is sown, cover it to a depth of ¾ inch with fine sandy soil.

### *Lettuce*

Seed of *New York, Imperial D,* and *Webb's Wonderful* lettuce can be sown in seed beds or seed boxes this month. Cover with ¼ to ½ inch of fine sandy soil.

### *Celery*

Celery can be planted out this month. Suitable varieties are *Golden Plume* and *Golden Self-blanching,* and for those who like the whiter types *Export White,* sometimes called *South Australian,* is a good variety.

Space the rows about 3 feet apart and allow about 8 inches between the plants. It is advisable to plant the celery in a trench about 6 inches deep, or, if this is not possible, plant on the surface and use boards along the sides of the rows to blanch the plants when they are nearly fully developed. In deep soils the trench system is useful because the stems can be tied and the soil can be drawn up to them for blanching.

# IRON DEFICIENCY CHLOROSIS OF FLAX

By C. R. MILLIKAN, M.Agr.Sc., Plant Pathologist, Biological Branch

IN the 1943 season a yellowing disease occurred at Westmere in a crop of flax growing on about 10 acres of a deep, black, self-mulching soil containing a high percentage of limestone (pH 8·2). The same area had previously grown satisfactory crops of oats.

### *Symptoms*

An excellent germination was obtained, but about three weeks afterwards the chlorotic symptoms appeared. The new leaves produced by the plants were devoid of any green pigment and appeared yellow to white in colour. Subsequent growth was very retarded, and the top of the plant took on a rosetted appearance due to the shortening of the internodes between the leaves. Many of the plants died, leaving large bare patches in the crop, and the remainder, although they survived, did not make much growth.

In October, however, these surviving plants began to recover from the condition. The newly-formed leaves produced at this time were of a normal green colour, and the length of the internodes increased appreciably, with the result that the plants finally reached a height of approximately 20 inches.

This recovery of the plants appeared to be associated with the onset of warmer and drier weather in the spring.

### *Mineral Deficiency Experiments*

Scholz (1934) has described a chlorosis of flax caused by a high concentration of calcium carbonate in the soil. The disease was cured in early growth by the application of salts of iron. On the other hand, applications of manganese or magnesium salts did not lessen the disease.

Iron deficiency symptoms are first seen in the younger tissues of the plant. This is due to the fact that there is no relocation of iron from the older to the younger leaves (Glenister, 1944). The gradient is of decreasing iron content going from the bottom to the top of the plant.

The effect of iron sulphate in the cure of flax chlorosis. Left—Sprayed with a 1 per cent. solution of iron sulphate. Right—Unsprayed.

Thorne and Wallace (1944) have studied some of the factors affecting chlorosis on high lime soils. Their results have shown that the soil and plant conditions associated with the chlorosis are more conducive to the maintenance of iron in the form of insoluble ferric compounds, than are conditions in both soils and plants associated with normal green leaf development. Iron salts added to such soils were rapidly immobilized. For this reason applications of large amounts of iron salts may be necessary to prevent the development of chlorosis.

Experiments were made to demonstrate the cause and control of the disease in flax at Westmere. These consisted of sand and water cultures to determine the symptoms of deficiencies of nutrient elements in flax, and of pot experiments in which the effects on the incidence of chlorosis of dressings of various minerals applied to Westmere soil were studied.

#### Sand and Water Cultures.

Symptoms of deficiences of calcium, phosphorus, nitrogen, magnesium, potassium, zinc

and copper respectively in flax have been described elsewhere (Millikan, 1944). Similarly, Schropp and Arenz (1938) have described boron deficiency symptoms in flax. None of the above symptoms was similar to those shown by the plants at Westmere. On the other hand the chlorosis cured by iron salts described by Scholz (1934) appeared to be similar.

Iron deficiency symptoms were therefore produced in flax growing in water cultures at Burnley. The newly formed leaves of the plants suffering from iron deficiency were yellow to cream in colour, which symptom was accompanied by a cessation of, or a marked reduction in, the rate of growth.

Upon the addition of an iron salt to the solutions the plants recovered. Leaves subsequently produced were of a normal green colour, and a marked increase in the length of the internodes between them occurred. These symptoms appeared to be identical with those shown by the Westmere plants.

### Pot Experiments.

*Method.*—Soil obtained from a badly-affected patch in the crop at Westmere was placed in pots at Burnley and the following mineral treatments were applied at the rates per acre indicated:—

| | |
|---|---|
| Untreated | |
| Potassium sulphate | .. 1 cwt. |
| Manganese sulphate | .. 28 lb. |
| Zinc sulphate | .. 28 lb. |
| Borax .. | .. 20 lb. |
| Iron sulphate | .. 56 lb. |
| Iron sulphate | .. 5 cwt. |

All pots were given a dressing of superphosphate 1 cwt. per acre, and each treatment was replicated four times. The pots were sown in May with Concurrent flax.

A further test was conducted in which no mineral treatment was added to the soil. However, after the appearance of chlorosis in the seedlings, half the plants in each pot was sprayed with a 1 per cent. solution of ferrous sulphate, the remaining plants being unsprayed.

To test the effect of seasonal conditions on the incidence of the disease a sowing was made in some pots during the summer (sown November), and a further sowing in the same pots was made the following winter (sown May).

*Results.*—Treatment with either potassium, manganese, zinc or boron salts had no affect on the incidence of chlorosis. However, the plants receiving the heavier dressing of iron sulphate appeared quite normal and showed no signs of chlorosis. The lighter dressing of iron sulphate on the other hand was not so effective in preventing the development of chlorosis, although these plants were superior to the controls in this regard. This result appears to support the finding of Thorne and Wallace (1944) that iron salts may be rapidly immobilized by the soil.

In the spraying experiment it was found that the chlorosis could be cured by spraying with iron sulphate (Fig. 1). The development of green colour in the chlorotic leaves was first noticeable approximately four days after the application of the spray.

From the above it was evident, therefore, that the chlorosis was due to a deficiency of available iron in the soil.

The results of the time of sowing experiment showed that, whereas marked chlorosis developed in flax sown in the winter months, plants grown in the same pots during the summer months were free from the disease. It seems evident, therefore, that there was an increased amount of iron available to the plants during the summer months. Such a phenomenon would explain the recovery shown by the plants in the field during the late spring and early summer months. This apparent relationship to weather conditions is similar to that described by Flor (1943) for a chlorotic die-back of flax on calcareous soil. The chlorotic phase of the disease was most severe in the wetter soils and at low soil temperatures.

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# Standard Herd Records

## For Quarter ended 31st December, 1944

In the following are set out the records of all cows which completed a lactation during the quarter. The number is 263, of which 159 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies with the age class to which the animal belongs, the standard being as follows:—

| | |
|---|---|
| Junior 2-year old (under 2½ years at time of calving) .. | 230 lb. butter-fat. |
| Senior 2-year old (between 2½ and 3 years at time of calving) .. | 250 lb. butter-fat. |
| Junior 3-year old (between 3 and 3½ years at time of calving) .. | 270 lb. butter-fat. |
| Senior 3-year old (between 3½ and 4 years at time of calving) .. | 290 lb. butter-fat. |
| Junior 4-year old (between 4 and 4½ years at time of calving) .. | 310 lb. butter-fat. |
| Senior 4-year old (between 4½ and 5 years at time of calving) .. | 330 lb. butter-fat. |
| Mature cow 5 years and over .. .. .. .. .. | 350 lb. butter-fat. |

N.C.K. denotes no chart kept.

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Andrew W., Whittlesea, Ayrshire (1).** | | | | | | | | | | |
| Scotsburn Pearl .. .. | Vol. 36 | 210 (Sold) | .. | 4,050 | 3·97 | 160·6 | 270 | Jr. 3 | 225 .. | Scotswood Gordon |
| **Atkinson, W. K., Swan Hill, Dairy Shorthorn (6).** | | | | | | | | | | |
| Willow Park Comet 33rd .. | C.C. | 273 | 13 | 6,609 | 3·85 | 254·5 | 270 | Jr. 3 | .. .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Comet 40th .. | C.C. | 273 | 18 | 6,842 | 4·21 | 288·3 | 230 | Jr. 2 | .. .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Countess 30th | 1511c | 273 | 9 | 8,451 | 3·32 | 280·4 | 350 | Mature | 319, 227, 285 | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Countess 46th | C.C. | 273 | 16 | 7,278 | 3·42 | 249·0 | 230 | Jr. 2 | .. .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Melba 48th .. | C.C. | 273 | 19½ | 7,740 | 3·71 | 287·4 | 230 | Jr. 2 | .. .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Rosebud .. | 243A | 210 | 4 | 5,160 | 3·38 | 174·5 | 350 | Mature | 241, 273, 179, 202, 230, 219 | Steventon Forester |
| **Ballarat Orphanage, Ballarat, Jersey (6).** | | | | | | | | | | |
| Orphanage Dawn .. | Vol. 31 | 273 | N.C.K. | 6,849 | 5·53 | 378·8 | 230 | Jr. 2 | .. .. | Clarendon Eyre Oxford Observer |
| Orphanage Handsome 7th | 88371 | 273 | N.C.K. | 5,196 | 6·37 | 330·9 | 270 | Jr. 3 | 357 .. | Orphanage Centaurus |
| Orphanage Melly 17th .. | Vol. 31 | 273 | N.C.K. | 5,619 | 6·40 | 359·7 | 270 | Jr. 3 | 199 .. | Orphanage Attraction Knight |
| Orphanage Silvermine 3rd | Vol. 31 | 240 (Sold) | N.C.K. | 3,975 | 4·75 | 189·0 | 250 | Sr. 2 | .. .. | Banyule Bungana |
| Orphanage Tiddlewinks .. | C.R. | 273 | N.C.K. | 4,925 | 5·53 | 272·4 | 270 | Jr. 3 | .. .. | Banyule Bungana |
| Uphaven Silver Dawn .. | 79350 | 273 | N.C.K. | 8,040 | 5·27 | 423·5 | 330 | Sr. 4 | 313, 393, 367 | Banyule Terraplane |
| **Banyule Pty. Ltd., Wangaratta, Jersey (2).** | | | | | | | | | | |
| Banyule Silvermine 142nd | 85083 | 273 | 11½ | 4,865 | 4·75 | 231·2 | 230 | Jr. 2 | .. .. | Heatherlea Regent (Imp.) |
| Banyule Tiddlewinks 33rd | 75076 | 273 | 14 | 5,475 | 5·35 | 292·9 | 290 | Sr. 3 | 283, 258 .. | Clarendon Eyre Utilites Oxford 4th |
| **Bennett, J. W., Yinnar, Jersey (8).** | | | | | | | | | | |
| Ellendale Bluebell 28th .. | Vol. 31 | 273 | N.C.K. | 5,840 | 6·39 | 373·4 | 230 | Jr. 2 | .. .. | Avalon Prince Madeira |
| Ellendale Bluebell 29th .. | Vol. 31 | 273 | N.C.K. | 5,466 | 5·87 | 321·4 | 230 | Jr. 2 | .. .. | Staghorn Bellboy |
| Ellendale Bluebell 32nd .. | Vol. 31 | 273 | N.C.K. | 6,405 | 5·90 | 377·7 | 230 | Jr. 2 | .. .. | Avalon Prince Madeira |
| Ellendale Duchess 14th .. | Vol. 31 | 273 | N.C.K. | 5,735 | 5·08 | 291·3 | 230 | Jr. 2 | .. .. | Avalon Prince Madeira |
| Ellendale Kirsty 50th .. | Vol. 31 | 273 | N.C.K. | 6,158 | 5·43 | 334·4 | 270 | Jr. 3 | 283 .. | Avalon Prince Madeira |
| Ellendale Kirsty 58th .. | Vol. 31 | 273 | N.C.K. | 5,719 | 5·68 | 324·8 | 230 | Jr. 2 | .. .. | Avalon Prince Madeira |
| Ellendale Romany 26th .. | Vol. 31 | 273 | N.C.K. | 5,464 | 5·36 | 292·8 | 230 | Jr. 2 | .. .. | Avalon Prince Madeira |
| Ellendale Vanilla 6th .. | 76095 | 273 | N.C.K. | 6,428 | 5·35 | 343·9 | 350 | Mature | 399, 424, 377 | Staghorn Bellboy |
| **Bennett, R. H., Lancefield, Jersey (4).** | | | | | | | | | | |
| Edenhope Countess .. | 66300 | 273 | 23 | 7,530 | 5·95 | 448·1 | 350 | Mature | 326, 388, 387, 366 | Edenhope Masterpiece |
| Edenhope Madeira's Peggy | Vol. 31 | 273 | 13 | 4,421 | 6·13 | 271·1 | 230 | Jr. 2 | .. .. | Karrara Standard Beau |
| Edenhope Queenie .. | 66306 | 273 | 27 | 9,104 | 6·01 | 547·0 | 350 | Mature | 412, 455, 401, 469 | Edenhope Masterpiece |
| Edenhope Rosetta .. | 76038 | 273 | 22 | 8,543 | 5·77 | 492·9 | 350 | Mature | 482, 391, 419 | Edenhope First Choice |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Black, Estate of the late I. S., Ayrshire (6).** | | | | | | | | | | |
| Mount Noorat Alert 9th .. | 32803 | 273 | 12 | 7,598 | 3·83 | 290·9 | 350 | Mature | 332, 235, 172 | Mount Noorat Gerontius |
| Mount Noorat Alert 18th.. | 35699 | 273 | 16 | 4,955 | 4·53 | 224·5 | 250 | Sr. 2 | .. .. | Gowrie Park Bonnie Standard |
| Mount Noorat Balkis .. | 35700 | 180 | 4 | 2,730 | 4·41 | 120·5 | 250 | Sr. 2 | 165 .. | Sandhill Kipling (Imp.) |
| Mount Noorat Boronia 5th | 33888 | 273 | 15 | 7,188 | 4·42 | 318·0 | 350 | Mature | 324, 393, 301 | Mount Noorat Valiant |
| Mount Noorat Georgina 5th | 29777 | 273 | 13 | 7,194 | 4·15 | 298·3 | 350 | Mature | 379, 318, 466, 415, 406, 371 | Gowrie Park Scottish Patron |
| Mount Noorat Mussua .. | 34883 | 273 | 9 | 4,001 | 4·28 | 171·4 | 290 | Sr. 3 | 354 .. | Sandhill Kipling (Imp.) |
| **Broad, Mrs. A. A., Sutton Grange, Jersey (1).** | | | | | | | | | | |
| Grangelea Pretty Primrose 2nd | 61943 | 273 | 20½ | 8,582 | 5·00 | 423·7 | 350 | Mature | 441, 388, 401, 330 | Grangelea Daffodil's Airo |
| **Broad, A. J., Pyramid, Jersey (1).** | | | | | | | | | | |
| Grangelea Rose Petal .. | 48526 | 273 | 17 | 5,607 | 4·52 | 253·4 | 350 | Mature | 436, 336, 316 | Clarendon Eyre Ruddigore 3rd |
| **Butcher, F. T., Swan Hill, Red Poll (1).** | | | | | | | | | | |
| Maryville Fancy .. .. | 7863A | 273 | 15 | 7,844 | 3·82 | 299·7 | 290 | Sr. 3 | 226, 285 .. | Victoria Generator |
| **Candler, G. E., Hamilton, Ayrshire (2).** | | | | | | | | | | |
| Jennewar Minnie 3rd .. | 36455 | 273 | 19 | 7,077 | 4·55 | 322·3 | 250 | Sr. 2 | .. .. | Inverurie Lauchie |
| Jennewar Queenie .. | 36456 | 273 | 12 | 7,838 | 4·07 | 319·1 | 270 | Jr. 3 | 257 .. | Inverurie Lauchie |
| **Carne, W. J., Pakenham Upper, Jersey (1).** | | | | | | | | | | |
| Navuloa Master's Ladybird | 63365 | 273 | N.C.K. | 9,245 | 5·47 | 506·0 | 350 | Mature | 383, 435, 454, 359 | Werribee Grandmaster |
| **Central Methodist Mission, Lilydale, Guernsey (1).** | | | | | | | | | | |
| Melbourne Golden Waterlily | 7428 | 273 | 15 | 7,322 | 4·94 | 361·5 | 350 | Mature | 243, 302, 384, 264 | Nundorah Daredevil |
| **Chadderton, J. E., Hamilton, Jersey (2).** | | | | | | | | | | |
| Glen Leigh Dignity 3rd .. | 81449 | 273 | 18½ | 4,971 | 5·29 | 263·2 | 230 | Jr. 2 | .. .. | Glen Leigh Volunteer |
| Glen Leigh Dilly 2nd .. | 81450 | 273 | 16½ | 4,880 | 4·94 | 241·3 | 230 | Jr. 2 | .. .. | Selsey Taxpayer |
| **Chirnside, R. M., Whittlesea, Jersey (3).** | | | | | | | | | | |
| Mornmoot Fancy Starbright 3rd | 63199 | 273 | 22 | 7,821 | 5·53 | 432·8 | 350 | Mature | 423, 530, 471, 462 | Werribee Madeira's Ace |
| Mornmoot Princess Madeira 27th | 87972 | 273 | 26 | 7,023 | 5·54 | 389·2 | 230 | Jr. 2 | .. .. | War Valour (Imp.) |
| Werribee Alexia .. .. | 79580 | 273 | 35 | 11,487 | 5·13 | 588·8 | 310 | Jr. 4 | 371, 475 .. | Werribee Rex |
| **Clark, P. W. and Son, Whittlesea, Jersey (2).** | | | | | | | | | | |
| Coodardy Rupert's Annette 4th | 85717 | 273 | 11 | 6,419 | 5·27 | 338·0 | 230 | Jr. 2 | .. .. | Brucevale Lord Rupert |
| Coodardy Wyandotte .. | 85725 | 273 | 22 | 9,751 | 5·10 | 497·0 | 310 | Jr. 4 | 503, 476 .. | Werribee Centurion |
| **Colenso, L. W. R., Alvie, Jersey (5).** | | | | | | | | | | |
| Normandie Golden Nancy 5th | 78133 | 273 | 25 | 7,491 | 5·62 | 421·2 | 330 | Sr. 4 | 348,434 .. | Lewisham Playboy |
| Normandie Hawthorn 23rd | 83187 | 273 | 19 | 5,939 | 5·39 | 320·4 | 290 | Sr. 3 | 301, 295 .. | Normandie Majestic |
| Normandie Ilma 6th .. | 68362 | 273 | 27 | 7,118 | 5·84 | 415·6 | 350 | Mature | 358, 435, 472, 545 | Normandie Majestic |
| Normandie Ilma 11th .. | 78136 | 273 | 28 | 7,961 | 5·38 | 428·2 | 330 | Sr. 4 | 338, 391 .. | Lewisham Playboy |
| Normandie Ilma 13th .. | 83189 | 273 | 17 | 5,971 | 6·03 | 360·3 | 310 | Jr. 4 | 400 .. | Normandie Majestic |
| **Coulthard, J. J., Whittlesea, Jersey (4).** | | | | | | | | | | |
| Walamba Lady Brae .. | 84423 | 273 | 14 | 4,707 | 4·99 | 235·0 | 330 | Sr. 4 | 239, 267 .. | Airlie Don |
| Walamba Nancy Grey .. | Vol. 31 | 273 | 22 | 5,118 | 4·55 | 233·1 | 230 | Jr. 2 | .. .. | The Wattle's Gamboge 3rd |
| Walamba Patsy .. .. | Vol. 31 | 273 | 25½ | 5,280 | 5·30 | 280·0 | 350 | Mature | 310, 292, 279 | Selsey Wonderful Boy |
| Walamba Rosanna .. | C.R. | 273 | 8 | 3,296 | 5·74 | 189·1 | 230 | Jr. 2 | .. .. | Clarendon Eyre Brigadier 3rd |
| **Cowan, G. L. S., Bacchus Marsh, Friesian (1).** | | | | | | | | | | |
| Upper Lappan Beth .. | Vol. 15 | 273 | N.C.K. | 11,948 | 3·72 | 444 0 | 310 | Jr. 4 | 368, 382 .. | Upper Lappan Pontiac |
| **Cuddihy, T. D., Geelong, Jersey (1).** | | | | | | | | | | |
| Pivot Pearl 2nd .. .. | C.R. | 273 | N.C.K. | 4,031 | 5·10 | 207·1 | 250 | Sr. 2 | 192 .. | Belgonia Pioneer |
| **Dennis, Mrs. A. A., Frankston, Jersey (1).** | | | | | | | | | | |
| Ballam Lilac's Damosel .. | 85003 | 273 | 18 | 5,318 | 6·66 | 354·0 | 230 | Jr. 2 | .. .. | Ballam Preference |
| **Department of Agriculture, Werribee, Friesian (4).** | | | | | | | | | | |
| Victoria Amaza .. .. | Vol. 15 | 273 | 21½ | 11,325 | 3·34 | 378·2 | 290 | Sr. 3 | 291 .. | Victoria Conductor |
| Victoria Geisha .. .. | 6084 | 273 | 32 | 12,241 | 3·87 | 473·4 | 350 | Mature | 334, 423, 413 | Victoria Mikado |
| Victoria Olga .. .. | Vol. 15 | 273 | 40 | 13,758 | 3·15 | 433·2 | 230 | Jr. 2 | .. .. | Terling Hypothesis (Imp.) |
| Victoria Sonnet .. .. | Vol. 15 | 273 | 29½ | 12,887 | 2·88 | 371·2 | 230 | Jr. 2 | .. .. | Terling Hypothesis (Imp.) |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Department of Agriculture, Werribee, Red Poll (9).** | | | | | | | | | | |
| Victoria Amabel .. .. | 7003A | 273 | 4 | 7,755 | 4·15 | 321·5 | 350 | Mature | 287, 374, 393 | Woodburn Peter Pan |
| Victoria Avrice .. .. | C.R. | 273 | 20 | 5,897 | 4·80 | 283·3 | 310 | Jr. 4 | .. .. | Burnwood Masterpiece |
| Victoria Janet .. .. | Vol. 12 | 273 | 20½ | 9,399 | 4·58 | 430·3 | 290 | Sr. 3 | 356 .. | Burnwood Masterpiece |
| Victoria Phyllis .. .. | Vol. 12 | 273 | 24 | 8,601 | 3·88 | 333·3 | 270 | Jr. 3 | 257 .. | Burnwood Masterpiece |
| Victoria Prune .. .. | 7021A | 273 | 13½ | 6,927 | 4·47 | 309·7 | 350 | Mature | 277, 362, 382, 440, 365 | Woodburn Peter Pan |
| Victoria Reliance .. | Vol. 12 | 273 | 9 | 6,635 | 4·53 | 300·8 | 330 | Sr. 4 | 403, 404 .. | Woodburn Peter Pan |
| Victoria Tambula .. | Vol. 12 | 273 | 20 | 7,583 | 4·26 | 322·7 | 250 | Sr. 2 | .. .. | Burnwood Masterpiece |
| Victoria Temple .. .. | Vol. 12 | 273 | 13½ | 8,421 | 4·24 | 356·8 | 290 | Sr. 3 | 352 .. | Burnwood Masterpiece |
| Victoria Veena .. .. | Vol. 12 | 273 | 11½ | 9,566 | 4·04 | 386·4 | 290 | Sr. 3 | 368 .. | Burnwood Masterpiece |
| **Desmond, J. J., Rochester, Jersey (2).** | | | | | | | | | | |
| Macroom Duchess 2nd .. | C.R. | 273 | N.C.K. | 5,685 | 5·80 | 329·8 | 230 | Jr. 2 | .. .. | Clifford Farm Robin Adair |
| Macroom Ellen 9th .. | C.R. | 240 | 4 | 4,320 | 4·44 | 191·8 | 230 | Jr. 2 | .. .. | Macroom Edna's Spot |
| **Dookie Agricultural College, Dookie, Ayrshire (3).** | | | | | | | | | | |
| Dookie Dainty .. .. | Vol. 37 | 273 | N.C.K. | 4,754 | 4·71 | 223·9 | 250 | Sr. 2 | .. .. | Gowrie Park Bonnie Sailor |
| Dookie Dolores .. .. | Vol. 37 | 273 | N.C.K. | 4,837 | 3·90 | 188·7 | 250 | Sr. 2 | .. .. | Gowrie Park Bonnie Sailor |
| Dookie Patrica .. .. | 35373 | 273 | N.C.K. | 6,573 | 3·87 | 254·4 | 290 | Sr. 3 | 192 .. | Dookie Radium |
| **Enders, N. H., Stanhope, Jersey (1).** | | | | | | | | | | |
| The Wattle's Silvermine 18th | 89273 | 273 | 27 | 6,743 | 4·97 | 334·9 | 250 | Sr. 2 | .. .. | Sweet Haven Oxford Count |
| **Fairchild and Clutterbuck, Tinamba, Jersey (4).** | | | | | | | | | | |
| Elsey Champion Myrtle .. | 73875 | 273 | N.C.K. | 5,761 | 4·74 | 273·1 | 350 | Mature | 332, 412 .. | Brampton Son of Champions (Imp.) |
| Vaucluse Pansy 3rd .. | 84391 | 273 | N.C.K. | 5,630 | 5·59 | 314·8 | 290 | Sr. 3 | 328 .. | Vaucluse Masterpiece |
| Vaucluse Tinsel 8th .. | Vol. 31 | 273 | N.C.K. | 5,029 | 5·27 | 265·0 | 230 | Jr. 2 | .. .. | Vaucluse Royal Purple |
| Vaucluse Trilby .. .. | 69525 | 273 | N.C.K. | 5,103 | 5·70 | 290·9 | 350 | Mature | 326, 442, 452, 393, 380 | Glen Iris Violin |
| **Fixter, A., Boisdale, Guernsey (7).** | | | | | | | | | | |
| Avonview Buttercup 2nd .. | 6725 | 240 (Sold) | .. | 6,180 | 5·13 | 317·1 | 350 | Mature | 325, 290, 344, 371 | Kentdale Monogram |
| Avonview Buttercup 4th .. | 9862 | 210 (Sold) | .. | 4,245 | 4·54 | 192·6 | 230 | Jr. 2 | .. .. | Avonview Monogram 12th |
| Avonview Dulcie 3rd's Camilla | 9870 | 273 | 13 | 6,513 | 4·88 | 317·9 | 290 | Sr. 3 | .. .. | Vermont Camilla's Sunrise |
| Avonview Jean .. .. | 6729 | 273 | 22 | 7,516 | 5·55 | 416·8 | 350 | Mature | 351, 417, 382, 481, 458 | Kentdale Monogram |
| Avonview Royal Lady .. | 8278 | 273 | 11 | 6,815 | 5·17 | 352·6 | 310 | Jr. 4 | 407, 441 .. | Vermont Camilla's Sunrise |
| Avonview Runica's Winnie | 9876 | 273 | 20 | 6,917 | 5·6 | 387·6 | 270 | Jr. 3 | 307 .. | Avonview Monogram 12th |
| Avonview Dewdrop .. | 9864 | 273 | 22 | 6,606 | 5·53 | 365·6 | 230 | Jr. 2 | .. .. | Avonview Monogram 12th |
| **Gay, R. G., and Son, Yarram, Jersey (4).** | | | | | | | | | | |
| Elm Grove Golden Bluebell | 8190 | 273 | N.C.K. | 7,101 | 6·05 | 429·7 | 310 | Jr. 4 | 373 .. | Elm Grove Gold Star |
| Elm Grove Silvershine .. | 71183 | 273 | N.C.K. | 5,678 | 6·39 | 362·6 | 350 | Mature | 290, 394, 407, 364 | Gold Star of Melrose |
| Elm Grove Songstress .. | 76120 | 273 | N.C.K. | 8,295 | 5·30 | 439·8 | 350 | Mature | 334, 484, 469 | Gold Star of Melrose |
| Elm Grove Victorious Dawn | 86140 | 273 | N.C.K. | 6,993 | 4·72 | 330·0 | 270 | Jr. 3 | 305 .. | Mornmoot War Victor |
| **Grice, C. S., Somerville, Jersey (1).** | | | | | | | | | | |
| Genoma Silvermine .. | 81512 | 240 | 4 | 2,745 | 6·15 | 168·7 | 290 | Sr. 3 | .. .. | Banyule Camber |
| **Handbury, J. E., and Son, Toora, Jersey (1).** | | | | | | | | | | |
| Tooravale Princess 45th .. | 89335 | 180 | 4 | 3,345 | 6·40 | 214·2 | 270 | Jr. 3 | 277 .. | Pinewood's Aristocrat (Imp.) |
| **Hardie, R. B., Lardner, Jersey (7).** | | | | | | | | | | |
| Gen Urquhart Dandy Banksia | Vol. 31 | 273 | 23½ | 7,211 | 4·95 | 356·9 | 250 | Sr. 2 | .. .. | Tooravale Dandy 3rd's Son |
| Gen Urquhart Dandy Charm | C.R. | 273 | 11½ | 4,809 | 5·22 | 251·0 | 230 | Jr. 2 | .. .. | Tooravale Dandy 3rd's Son |
| Gen Urquhart Dandy Princess | Vol. 32 | 273 | 27 | 7,701 | 5·89 | 453·5 | 230 | Jr. 2 | .. .. | Tooravale Dandy 3rd's Son |
| Gen Urquhart Golden Banksia | Vol. 32 | 273 | 20½ | 7,631 | 5·38 | 410·7 | 290 | Sr. 3 | 316 .. | Bellefaire Golden Chevron |
| Gen Urquhart Golden Lass | Vol. 31 | 273 | 16½ | 7,838 | 4·25 | 333·1 | 270 | Jr. 3 | 316 .. | Bellefaire Golden Chevron |
| Gen Urquhart Golden Marie | Vol. 32 | 273 | 23 | 7,890 | 5·32 | 419·9 | 230 | Jr. 2 | .. .. | Bellefaire Golden Chevron |
| Oralau Masterpiece's Cream | 73320 | 273 | 31 | 9,438 | 5·03 | 474·7 | 350 | Mature | 333, 436, 482, 374 | Staghorn Laburnum's Masterpiece |
| **Hartley, C. G., Dandenong, Jersey (2).** | | | | | | | | | | |
| Barrowby Briar Rose .. | 60508 | 273 | N.C.K. | 5,667 | 5·63 | 318·9 | 350 | Mature | 303, 424, 411, 292, 289, 290 | Barrowby Sonny |
| Woodland's Daffodil .. | 89715 | 273 | N.C.K. | 4,567 | 5·92 | 270·5 | 270 | Jr. 3 | .. .. | Werribee Jupiter |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Harvey, T., Boisdale, Jersey (12)** | | | | | | | | | | |
| Jerseyholm Bluebell 37th .. | 62308 | 273 | N.C.K. | 4,911 | 4·93 | 242·0 | 350 | Mature | 358, 301, 336, 400 | Banyule Biplane |
| Jerseyholm Bluebell 39th .. | 67186 | 273 | N.C.K. | 8,702 | 5·73 | 498·4 | 350 | Mature | 332, 345, 322, 478 | Rowallan Silvanite |
| Jerseyholm Bluebell 47th .. | 71962 | 273 | N.C.K. | 9,620 | 5·07 | 487·9 | 350 | Mature | 320, 330, 436 | Glen Iris Royal Archer |
| Jerseyholm Bluebell 54th. | 71967 | 240 | N.C.K. | 5,895 | 5·16 | 304·4 | 310 | Jr. 4 | 297, 293 .. | Mornmoot Memnon 2nd |
| Jerseyholm Bluebell 48th .. | 57846 | 273 | N.C.K. | 9,007 | 4·85 | 436·5 | 350 | Mature | 337, 395, 430, 350, 492 | Jerseyholm Master's Fox 6th |
| Jerseyholm Empress 58th | 62313 | 273 | N.C.K. | 6,678 | 5·69 | 380·1 | 350 | Mature | 253, 240, 254, 357 | Banyule Biplane |
| Jerseyholm Empress 66th | 71970 | 273 | N.C.K. | 6,042 | 5·59 | 337·7 | 330 | Sr. 4 | 302, 370 .. | Orphanage Molly's Commander |
| Jerseyholm Empress 74th | 76960 | 273 | N.C.K. | 7,860 | 5·55 | 436·0 | 290 | Sr. 3 | 410 .. | Mornmoot Memnon 2nd |
| Jerseyholm Empress 88th | 86981 | 273 | N.C.K. | 5,426 | 5·25 | 284·7 | 230 | Jr. 2 | .. .. | Mornmoot Memnon 2nd |
| Jerseyholm Kirsty 41st .. | 71977 | 273 | N.C.K. | 6,339 | 5·31 | 336·5 | 330 | Sr. 4 | 280, 303 .. | Mornmoot Memnon 2nd |
| Jerseyholm Kirsty 42nd .. | 71978 | 273 | N.C.K. | 7,568 | 5·27 | 398·5 | 310 | Jr. 4 | 268, 327 .. | Orphanage Molly's Commander |
| Jerseyholm Lady Marge 27th | 86984 | 273 | N.C.K. | 6,078 | 4·58 | 278·1 | 230 | Jr. 2 | .. .. | Mornmoot Memnon 2nd |
| **Haywood, Dr. A. R., Hastings, Jersey (2).** | | | | | | | | | | |
| Windrest Chevy's Dainty .. | 74577 | 273 | N.C.K. | 6,758 | 5·41 | 365·6 | 350 | Mature | 357, 533, 497, 461, 402 | Gadget (Imp.) |
| Windrest Gadget's Rose .. | 89672 | 273 | N.C.K. | 8,219 | 5·92 | 486·6 | 310 | Jr. 4 | 380 .. | Gadget (Imp.) |
| **Higgins, J. A. A., Keysborough, Guernsey (1).** | | | | | | | | | | |
| Brighton Vale Dainty Maid | Vol. 14 | 273 | 15 | 6,111 | 5·23 | 319·9 | 270 | Jr. 3 | 275 .. | Melbourne Morland's Raymond |
| **Hodgins, G. E., Hastings, Jersey (3).** | | | | | | | | | | |
| Verjean Vesta 2nd .. | 84400 | 273 | 20 | 6,870 | 5·62 | 386·4 | 290 | Sr. 3 | 268, 293 .. | St. John's Letetia 10th's Chut |
| Verjean Virginia 3rd .. | 89457 | 273 | 18 | 7,226 | 5·50 | 397·1 | 290 | Sr. 3 | 311, 317 .. | St. John's Letetia 10th's Chut |
| Verjean Vocaliste .. | 89459 | 273 | 24 | 6,942 | 5·75 | 399·0 | 250 | Sr. 2 | 290 .. | Selsey Royal Chief |
| **Hore, E., Leitchville, Jersey (3).** | | | | | | | | | | |
| Milvue Aim's Honesty 6th | 87854 | 273 | N.C.K. | 8,169 | 5·15 | 421·0 | 290 | Sr. 3 | 394 .. | Belgonia Peggy 11th's Aim |
| The Wattle's Silvermine 9th | 74169 | 273 | N.C.K. | 5,673 | 5·51 | 312·4 | 350 | Mature | 345, 435, 372 | The Wattle's Young Gamboge |
| View Bank's Gay Girl .. | 59879 | 273 | N.C.K. | 8,194 | 4·49 | 367·7 | 350 | Mature | .. .. | View Bank's Bonnie Boy |
| **Hore, M. T., Horfield, Friesian (3).** | | | | | | | | | | |
| Elmar Kitty .. .. | Vol. 15 | 273 | N.C.K. | 8,960 | 3·29 | 294·9 | 270 | Jr. 3 | 227 .. | Elmar Roseberry |
| Elmar Rock Keyes .. | C.R. | 273 | N.C.K. | 13,142 | 3·42 | 449·5 | 350 | Mature | 340, 339, 439, 316 | Burnbank Iona Rock |
| Kelvale Iona Pansy .. | C.R. | 273 | N.C.K. | 6,189 | 3·86 | 239·2 | 230 | Sr. 3 | 225 .. | Kelvale Aristocrat |
| **Huffer, J. A., Gormandale, Jersey (1).** | | | | | | | | | | |
| Glenvalley Handsome Girl 8th | Vol. 31 | 273 | N.C.K. | 4,878 | 5·65 | 275·7 | 290 | Sr. 3 | .. .. | Avon Bonaparte |
| **Hurrey, Estate of the late W. H., Koonwarra, Jersey (1).** | | | | | | | | | | |
| Kooreena Yo Yo 9th .. | 7296 | 273 | 18½ | 5,253 | 6·51 | 341·8 | 310 | Jr. 4 | 328 .. | Kooreena Rover 3rd |
| **Jackson, H., Lockington, Jersey (1).** | | | | | | | | | | |
| Pine Ridge Rose Dream 5th | C.R. | 273 | N.C.K. | 9,009 | 5·02 | 452·6 | 290 | Sr. 3 | 310 .. | Belgonia Magnetic Chief |
| **Johnson, F. G., Horsham, Jersey (1).** | | | | | | | | | | |
| Orphanage Mirthmaker 10th | 83294 | 273 | N.C.K. | 5,877 | 5·43 | 319·3 | 310 | Jr. 4 | 246, 255 .. | Banyule Terraplane |
| **Lancaster, E. H., Lilydale, Jersey (3).** | | | | | | | | | | |
| Clifford Farm Bell .. | 75660 | 273 | 16½ | 5,735 | 4·84 | 277·4 | 310 | Jr. 4 | 281, 286 .. | Tavistock Quality Lad |
| Clifford Farm Briar Rose .. | Vol. 31 | 273 | 18½ | 7,509 | 5·58 | 418·9 | 230 | Jr. 2 | .. .. | Clifford Farm Leo |
| Clifford Farm Juliana .. | Vol. 31 | 273 | 14 | 4,841 | 5·56 | 269·3 | 230 | Jr. 2 | .. .. | Clifford Farm Leo |
| **Langlands, F. B., Horsham, Jersey (3).** | | | | | | | | | | |
| Brierwood Flower Girl 6th | 70482 | 273 | N.C.K. | 8,931 | 4·77 | 425·9 | 350 | Mature | 368, 436 .. | Murona Twylair |
| Brierwood Golden Millie .. | 75352 | 273 | N.C.K. | 6,060 | 4·73 | 286·6 | 350 | Mature | 400, 377, 342 | Murona Twylair |
| Brierwood Volunteer's Rose 2nd | 85340 | 60 | .. | 795 | 5·58 | 44·4 | 290 | Sr. 3 | .. .. | Murona Twylair |
| **Linke, H. P., Tarrington, Dairy Shorthorn (2).** | | | | | | | | | | |
| Corresdean Beauty 2nd .. | C.C. | 273 | 19 | 5,757 | 3·96 | 227·9 | 270 | Jr. 3 | 203 .. | Drumneil Prince 3rd. |
| Corresdean Princess .. | 1794E | 273 | 25½ | 7,098 | 3·50 | 248·3 | 330 | Sr. 4 | 242, 307 .. | Drumneil Prince 3rd |
| **Longerenong Agricultural College, Dooen, Ayrshire (2).** | | | | | | | | | | |
| Longerenong Cootamundra Wattle 8th | 32772 | 273 | N.C.K. | 5,454 | 3·97 | 216·6 | 330 | Sr. 4 | 309, 306 .. | Dookie Signet |
| Longerenong Cootamundra Wattle 11th | 34854 | 273 | N.C.K. | 5,455 | 4·69 | 256·0 | 290 | Sr. 3 | 208 .. | Dookie Signet |
| **Macauley, C. W., Rochester, Jersey (1).** | | | | | | | | | | |
| Taranah Radiance 5th .. | C.R. | 273 | N.C.K. | 4,662 | 5·77 | 269·2 | 230 | Jr. 2 | .. .. | Cormal Oxford Lad |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **McKenzie, Mrs. E. J., and Sons, Woodford, Jersey (5).** | | | | | | | | | | |
| Spring Valley Dillwynia .. | 78920 | 273 | 12 | 6,236 | 5·77 | 359·6 | 350 | Mature | 273, 313 .. | Samare's Golden Prince (Imp.) |
| Spring Valley Euphorbia 5th | 88979 | 273 | 6 | 3,917 | 5·33 | 208·6 | 270 | Jr. 3 | 202 .. | Spring Valley Buzalong |
| Spring Valley Evergreen 2nd | Vol. 31 | 273 | 17 | 4,251 | 5·80 | 246·7 | 230 | Jr. 2 | .. .. | Selsey Gay Prince |
| Spring Valley Maple 2nd .. | Vol. 31 | 273 | 10 | 4,295 | 5·08 | 218·3 | 250 | Sr. 2 | .. .. | Selsey Gay Prince |
| Spring Valley Sally 2nd .. | 83926 | 273 | 21 | 4,975 | 5·80 | 288·7 | 290 | Sr. 3 | 245, 225 .. | Selsey Gay Prince |
| **McNabb, G., and Son, Irrewillipe East, Jersey (4).** | | | | | | | | | | |
| Avalon Starbright's Pansy 9th | 70069 | 273 | N.C.K. | 6,244 | 5·97 | 372·7 | 350 | Mature | 276, 388, 345 | Avalon Starbright 8th |
| Maxon D's Favourite 3rd | 82706 | 273 | N.C.K. | 4,797 | 5·20 | 249·3 | 270 | Jr. 3 | 244 .. | Maxon Count's Dawn |
| Maxon Madeira's Favourite 2nd | Vol. 31 | 273 | N.C.K. | 4,399 | 5·06 | 222·6 | 250 | Sr. 2 | 268 .. | Avalon Prince Madeira 26th |
| Xavier Dolichos .. .. | Vol. 31 | 273 | N.C.K. | 5,706 | 6·35 | 362·6 | 350 | Mature | 408, 412 .. | Bellefaire Blonde's Bellozanne |
| **Maher, R. H., Tongala, Jersey (1).** | | | | | | | | | | |
| Rosemont Lady Fowler 38th | 88812 | 273 | N.C.K. | 5,121 | 5·83 | 298·4 | 290 | Sr. 3 | .. .. | Belgonia Aim High |
| **Manly, R. A. A., Somerville, Dairy Shorthorn (1).** | | | | | | | | | | |
| Irenavin Park Belle .. | C.C. | 273 | 16 | 6,093 | 3·42 | 208·1 | 310 | Jr. 4 | 176 .. | Liberton Patriot 4th |
| **Meaklim Bros., Mooroopna, Dairy Shorthorn (6).** | | | | | | | | | | |
| Irumneil Beauty 7th .. | C.C. | 273 | 18 | 9,558 | 3·64 | 348·3 | 250 | Sr. 2 | 251 .. | Willow Park Barrington 46th |
| Irumneil Dulcie 2nd .. | 1840E | 273 | 17 | 10,089 | 3·17 | 319·9 | 330 | Sr. 4 | 275, 306 .. | Willow Park Barrington 46th |
| Irumneil Ida 2nd .. | C.C. | 273 | 10 | 10,170 | 3·40 | 345·3 | 310 | Jr. 4 | 285, 307 .. | Willow Park Barrington 46th |
| Irumneil Lily 3rd .. | C.C. | 273 | 26 | 11,223 | 3·46 | 388·0 | 330 | Sr. 4 | 318, 352 .. | Willow Park Barrington 46th |
| Irumneil Lily 4th .. | C.C. | 273 | 29 | 10,517 | 3·65 | 383·8 | 270 | Jr. 3 | 356 .. | Willow Park Barrington 46th |
| Irumneil Nellie 3rd .. | 779E | 273 | 30 | 12,189 | 3·20 | 390·3 | 350 | Mature | 328, 453, 367, 454, 353, 417, 395, 406 | Willow Park Reformer |
| **Mitchell, R. H., Linton, Jersey (4).** | | | | | | | | | | |
| Clifford Farm Gladsome .. | 32965 | 273 | 19½ | 6,704 | 6·08 | 407·7 | 350 | Mature | 411, 465, 472, 367, 454, 718, 602, 527, 549 | Clifford Farm Eliminator |
| Clifford Farm Joyous Melody | 52272 | 273 | 25½ | 7,337 | 570 | 417·9 | 350 | Mature | 379, 408, 459, 539, 492 | Wompini V.C. |
| Clifford Farm Ladybird .. | 80741 | 273 | 30½ | 8,654 | 5·41 | 468·6 | 310 | Jr. 4 | 387, 388 .. | Clifford Farm Danny Boy |
| Clifford Farm Lily .. | Vol. 31 | 273 | 18 | 5,901 | 5·51 | 325·3 | 230 | Jr. 2 | .. .. | Clifford Farm Leo |
| **Moore, J., and Co., Yarram, Jersey (8).** | | | | | | | | | | |
| Avon Dodo .. .. | 70073 | 273 | N.C.K. | 3,021 | 5·81 | 175·6 | 350 | Mature | 413, 503, 430 | Ruby's Beau (Imp.) |
| Avon Dorothy 3rd .. | Vol. 31 | 210 | N.C.K. | 1,680 | 5·42 | 91·1 | 270 | Jr. 3 | 183 .. | Avon Bandolin |
| Clarendon Eyre Camille 11th | 56799 | 273 | N.C.K. | 4,716 | 4·79 | 225·9 | 350 | Mature | 298, 336, 477, 298, 279, 417, 284 | Victoricus Pioneer (Imp.) |
| Tooloonook Camille 10th .. | Vol. 31 | 273 | N.C.K. | 3,290 | 4·63 | 152·3 | 230 | Jr. 2 | .. .. | Belgonia Junette 2nd's Design |
| Tooloonook Molly 15th .. | 79249 | 273 | N.C.K. | 5,262 | 5·28 | 277·6 | 350 | Mature | 312, 218, 293, 285 | Latrobe Musician |
| Tooloonook Onyx 3rd .. | Vol. 31 | 273 | N.C.K. | 3,099 | 4·86 | 150·7 | 230 | Jr. 2 | .. .. | Belgonia Junette 2nd's Design |
| Tooloonook Peach 12th .. | 79254 | 273 | N.C.K. | 5,324 | 5·42 | 288·6 | 350 | Mature | 193, 217, 372, 309 | Belgonia Lady's Duke |
| Tooloonook Plumbago 9th | 74212 | 273 | N.C.K. | 5,583 | 5·76 | 321·7 | 350 | Mature | 276, 305, 402, 303 | Latrobe Musician |
| **Nicholas, M. A., Sherbrooke, Jersey (1).** | | | | | | | | | | |
| Selsey Great Beauty .. | 83874 | 273 | 17 | 5,336 | 5·57 | 297·0 | 270 | Jr. 3 | 307 .. | Selsey Great Prometheus |
| **Nicholson, A. N., Moorooduc, Illawarra Shorthorn (5).** | | | | | | | | | | |
| Devondale Dove 3rd .. | Vol. 9 | 273 | N.C.K. | 6,270 | 4·19 | 263·0 | 310 | Jr. 4 | 196 .. | Devondale Guardsman |
| Devondale Virgin 3rd .. | 30068 | 150 | N.C.K. | 3,397 | 4·69 | 159·4 | 350 | Mature | 215 .. | Swanlea Broughton |
| Veresdale Heath .. .. | 33740 | 240 | N.C.K. | 6,465 | 3·41 | 220·4 | 310 | Jr. 4 | 250, 212 .. | Ovensdale Pearl's Renown |
| Veresdale Hetty .. .. | 33741 | 259 | N.C.K. | 6,084 | 3·31 | 201·2 | 310 | Jr. 4 | 213 .. | Ovensdale Pearl's Renown |
| Veresdale Posey .. .. | Vol. 9 | 210 | N.C.K. | 6,465 | 3·44 | 222·4 | 310 | Jr. 4 | 257, 284 .. | Numbawarra Maiden's Sultan |
| **Noonan, G., Benalla, Jersey (1).** | | | | | | | | | | |
| Noonavale Silvermine .. | Vol. 31 | 273 | 7 | 3,231 | 6·35 | 205·3 | 290 | Sr. 3 | .. .. | Belgonia Perree |
| **Parker, L. M., Tallarook, Dairy Shorthorn (4).** | | | | | | | | | | |
| Deep Dale Beryl .. | C.C. | 273 | N.C.K. | 8,895 | 3·71 | 330·2 | 330 | Sr. 4 | 275, 316 .. | Willow Park Barrington 26th |
| Deep Dale Bonnie 2nd .. | C.C. | 273 | N.C.K. | 7,904 | 3·43 | 271·2 | 290 | Sr. 3 | 252 .. | Willow Park Barrington 26th |
| Deep Dale Cherry 2nd .. | 1803E | 273 | N.C.K. | 8,328 | 4·05 | 337·3 | 350 | Mature | 387, 463, 334, 379 | Willow Park Banker 3rd |
| Deep Dale Sally 2nd .. | C.C. | 273 | N.C.K. | 8,106 | 4·32 | 350·0 | 330 | Sr. 4 | 273, 329 .. | Willow Park Barrington 26th |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Payne, A. E. T., Lilydale, Guernsey (7).** | | | | | | | | | | |
| Yarraview Carol .. .. | 9761 | 273 | 20 | 10,095 | 4·43 | 447·4 | 330 | Sr. 4 | 339, 258 .. | Honoria's Benefactor (Imp.) |
| Yarraview Clara's Fashion | 9766 | 273 | 21½ | 7,608 | 4·77 | 363·2 | 270 | Jr. 3 | 309, 325 .. | Honoria's Benefactor (Imp.) |
| Yarraview Faith .. .. | 11962 | 273 | 20 | 6,920 | 4·67 | 323·1 | 230 | Jr. 2 | .. .. | Yarraview Sovereign |
| Yarraview Honour .. | 9777 | 273 | 12½ | 7,617 | 4·14 | 315·0 | 310 | Jr. 4 | 359, 353 .. | Camilla's Majestic of Maple Lodge (Imp.) |
| Yarraview Rouante .. | 11977 | 273 | 15½ | 5,886 | 4·70 | 276·4 | 230 | Jr. 2 | .. .. | Honoria's Benefactor (Imp.) |
| Yarraview Rose Gem .. | 11976 | 273 | 17 | 4,111 | 3·64 | 149·8 | 230 | Jr. 2 | .. .. | Yarraview Rex |
| Yarraview Siren .. | 6643 | 273 | 34 | 11,732 | 6·10 | 715·9 | 350 | Mature | 407, 520, 528, 574, 520, 585 | Camilla's Majestic of Maple Lodge (Imp.) |
| **Powell, T. S., Mansfield, Jersey (6).** | | | | | | | | | | |
| Carellen Dainty Maid 2nd | 80671 | 273 | 16 | 4,677 | 5·63 | 263·1 | 270 | Jr. 3 | 309 .. | Mornmoot Magistrate 2nd |
| Carellen Golden Duchess .. | 70638 | 273 | 12 | 6,711 | 4·55 | 305·6 | 350 | Mature | 345, 380, 355 | Werribee Madeira's Ace |
| Carellen Lady Starbright .. | 65877 | 273 | 17 | 6,552 | 5·17 | 338·5 | 350 | Mature | 419, 548, 556, 441 | Darnum Park Lord Starbright |
| Carellen Melody 2nd .. | 75608 | 273 | 11½ | 5,697 | 4·58 | 261·0 | 310 | Jr. 4 | 333, 456, 346 | Mornmoot Magistrate |
| Carellen Noble Duchess .. | 80674 | 273 | 12 | 5,409 | 4·99 | 270·0 | 270 | Jr. 3 | .. .. | Werribee Planet |
| Carellen Pretty Maid .. | 85576 | 273 | 18 | 6,177 | 4·96 | 306·4 | 250 | Sr. 2 | .. .. | Mornmoot Viceroy 2nd |
| **Reid, Miss B. B., Bundoora, Jersey (7).** | | | | | | | | | | |
| Jubilee Dombeya .. | 72005 | 273 | 17 | 5,796 | 5·06 | 293·5 | 350 | Mature | 289, 206 .. | Jubilee Richlight |
| Jubilee Lawn .. .. | 81998 | 273 | 18 | 6,249 | 5·96 | 372·7 | 310 | Jr. 4 | 235 .. | Jubilee Torchlight |
| Jubilee Leontopodium .. | 87031 | 273 | 5 | 2,692 | 5·56 | 149·7 | 250 | Sr. 2 | 171 .. | Jubilee Richlight |
| Jubilee Lespedeza .. | 81999 | 273 | 20 | 5,070 | 6·13 | 310·6 | 310 | Jr. 4 | 234, 252 .. | Jubilee Richlight |
| Jubilee Lolium .. .. | 87033 | 273 | 13 | 5,055 | 4·75 | 240·0 | 270 | Jr. 3 | 146 .. | Jubilee Richlight |
| Jubilee Lovemist .. | 87034 | 273 | 18 | 5,093 | 5·04 | 256·9 | 270 | Jr. 3 | 193 .. | Jubilee Lanelight |
| Jubilee White Rose .. | 67244 | 273 | 16 | 5,315 | 5·07 | 269·6 | 350 | Mature | 313 .. | Jubilee Richlight |
| **Ronalds, O., and Son, Tarago, Jersey (1).** | | | | | | | | | | |
| Jindivick Babs .. .. | 87011 | 273 | N.C.K. | 8,007 | 5·57 | 446·3 | 290 | Sr. 3 | 460 .. | Mornmoot Meteor |
| **Ross, D. M., Croydon, Dairy Shorthorn (7).** | | | | | | | | | | |
| Namoi Queenie 15th .. | C.C. | 273 | 9 | 4,346 | 4·42 | 192·1 | 270 | Jr. 3 | 192 .. | Willow Park Duke 18th |
| Willow Park Camelia 40th | C.C. | 273 | 15 | 7,072 | 3·41 | 241·4 | 290 | Sr. 3 | .. .. | Willow Park Barrington 68th |
| Willow Park Countess 33rd | 1664D | 273 | 12 | 6,788 | 3·94 | 267·2 | 350 | Mature | 276, 235, 223 | Wicklesham Lord Barrington 5th (Imp.) |
| Willow Park Countess 47th | C.C. | 273 | 16 | 6,005 | 3·68 | 221·0 | 230 | Jr. 2 | .. .. | Willow Park Barrington 77th |
| Willow Park Damsel 16th | C.C. | 273 | 11½ | 6,830 | 3·28 | 224·1 | 270 | Jr. 3 | 188 .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Duchess 55th | C.C. | 273 | 11 | 6,048 | 3·46 | 209·1 | 270 | Jr. 3 | 189 .. | Willow Park Barrington 77th |
| Willow Park Fairy 13th .. | 1680D | 273 | 30 | 11,103 | 3·58 | 397·1 | 350 | Mature | 335, 383, 350, 374 | Anderson Imperial Cran 6th (Imp.) |
| **Shearman, A. and W., Darnum, Jersey (1).** | | | | | | | | | | |
| Darnum Park Fancy Starbright | Vol. 31 | 273 | 17½ | 5,655 | 6·27 | 354·4 | 350 | Mature | .. .. | Darnum Park Lord Starbright 2nd |
| **Smith Bros., Mirboo North, Jersey (1).** | | | | | | | | | | |
| Sylvan Hill Daisy 4th .. | Vol. 31 | 273 | N.C.K. | 3,569 | 4·70 | 167·7 | 230 | Jr. 2 | .. .. | Werribee Viceroy |
| **Smith, R. W., and Son, Koo-wee-rup, Friesian (2).** | | | | | | | | | | |
| Warwick Spring Patch .. | Vol. 15 | 273 | 30 | 10,671 | 3·10 | 331·2 | 230 | Jr. 2 | .. .. | Elmar Iona Patch |
| Wattle Bank Priscilla .. | Vol. 15 | 273 | 14 | 9,372 | 3·49 | 327·1 | 270 | Jr. 3 | 314 .. | Wattle Bank Oakwood De Kol |
| **Stephens, Dr. F. G., Vermont, Guernsey (5).** | | | | | | | | | | |
| Road's End Antoinette .. | 3409 | 273 | 16 | 7,848 | 4·86 | 381·1 | 350 | Mature | 398, 340, 303, 198, 295, 313 | Glenburnie Ideal (Imp.) |
| Vermont Mayfair .. | 8010 | 273 | 25 | 7,667 | 5·60 | 429·7 | 350 | Mature | 292, 396 .. | Vermont Camilla's Sunrise |
| Vermont Venus .. .. | 11749 | 273 | 10 | 5,460 | 5·08 | 277·6 | 250 | Sr. 2 | .. .. | Vermont Melfort |
| Yarraview Cynthia .. | 11957 | 273 | 20 | 5,677 | 4·93 | 279·9 | 250 | Sr. 2 | 373 .. | Sunrose of Maple Lodge (Imp.) |
| Yarraview Vampire .. | 11986 | 210 | 4 | 4,125 | 4·71 | 194·1 | 270 | Jr. 3 | 220 .. | Yarraview Earl |
| **Tait, W. G., Dreelte, Jersey (8).** | | | | | | | | | | |
| Glenvalley Silver Beauty .. | 71548 | 273 | 19½ | 5,607 | 5·91 | 331·4 | 350 | Mature | 376 .. | Brucevale Wyandotte King |
| Stonybank Belladonna .. | 73956 | 273 | 17 | 5,964 | 4·67 | 278·6 | 350 | Mature | 321, 435, 381 | Design's Golden Oxford (Imp.) |
| Stonybank Snowdrop 5th .. | 73964 | 273 | 14 | 4,994 | 5·27 | 263·2 | 350 | Mature | 288, 444, 395, 306 | Mornmoot Marius 2nd |
| Stonybank Snowdrop 7th | 83979 | 273 | 15 | 6,043 | 4·59 | 277·4 | 250 | Sr. 2 | 329 .. | Mornmoot War Ward |
| Stonybank Snowdrop 8th | 83980 | 273 | 13 | 5,372 | 5·26 | 283·6 | 250 | Sr. 2 | 325 .. | Mornmoot Marius 2nd |
| Stonybank Snowdrop 9th | 89031 | 273 | 18 | 5,552 | 5·65 | 313·8 | 230 | Jr. 2 | .. .. | Mornmoot War Ward |
| Stonybank Gaiety Girl 13th | 83976 | 273 | 12 | 4,523 | 5·08 | 229·9 | 250 | Sr. 2 | 263 .. | Mornmoot Marius 2nd |
| Stonybank Gaiety Girl 15th | 89030 | 273 | 12 | 4,085 | 6·86 | 280·2 | 230 | Jr. 2 | .. .. | Mornmoot War Ward |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Tandberg, G. and Son Warragul, Illawarra, Shorthorn (1).** | | | | | | | | | | |
| Myrtleville Mabel 3rd .. | Vol. 9 | 273 | 17 | 6,336 | 3·90 | 246·8 | 290 | Sr. 3 | 248 .. | Parkview Combination |
| **Trevaskis, F. T., Tongala, Jersey (2).** | | | | | | | | | | |
| Ballara Beauty .. .. | Vol. 31 | 273 | 14 | 4,864 | 4·72 | 230·0 | 230 | Jr. 2 | .. .. | Werribee Madeira's Ace |
| Ballara Model 21st .. | 85019 | 273 | 23 | 7,425 | 4·55 | 337·9 | 270 | Jr. 3 | .. .. | Werribee Madeira's Ace |
| **Turner, A. J., Yannathan, Jersey (3).** | | | | | | | | | | |
| Fontenay Canary .. | 86291 | 273 | N.C.K. | 4,038 | 6·12 | 247·1 | 250 | Sr. 2 | .. .. | Finchley Oxford Blue |
| Fontenay Golden Girl .. | 86292 | 273 | N.C.K. | 3,923 | 5·27 | 206·7 | 230 | Jr. 2 | .. .. | Maxmount Pearl's Master |
| King's Vale Lady Monica 70th | 87210 | 273 | N.C.K. | 4,187 | 5·24 | 219·2 | 250 | Sr. 2 | .. .. | King's Vale Bradman |
| **Tyssen, C. J., Warragul, Jersey (2).** | | | | | | | | | | |
| Hylsbroke Larkspur 5th .. | Vol. 31 | 273 | 13 | 4,059 | 5·96 | 241·8 | 230 | Jr. 2 | .. .. | The Wattles Young Gamboge |
| Somerville Primrose 2nd .. | 73913 | 273 | 21 | 6,003 | 6·21 | 373·0 | 350 | Mature | 325, 355, 362, 347 | Brampton Pioneer Chut (Imp.) |
| **Unthank, Miss Freda, Hastings, Jersey (1).** | | | | | | | | | | |
| St. John's Coral 2nd .. | 78821 | 273 | 19½ | 5,909 | 5·01 | 295·9 | 350 | Mature | 384 .. | St. John's Curio 9th's Lad |
| **Vaughan Bros., Girgarre, Jersey (3).** | | | | | | | | | | |
| Lynroy Fancy 5th .. | 87573 | 273 | N.C.K. | 6,543 | 6·29 | 411·4 | 330 | Sr. 4 | 347, 394 .. | Werribee Laverock |
| Lynroy Trixie .. .. | 87578 | 273 | N.C.K. | 4,718 | 5·10 | 240·7 | 270 | Jr. 3 | 246 .. | Lynroy Pixie's Prince |
| Lynroy Valetta .. .. | 87579 | 273 | N.C.K. | 4,692 | 5·57 | 261·2 | 270 | Jr. 3 | .. .. | Carellen Madeira's Pride |
| **Wade, G. F., Stratford, Jersey (8).** | | | | | | | | | | |
| Balneil Starbright .. | 56234 | 273 | N.C.K. | 6,335 | 5·36 | 339·3 | 350 | Mature | 253, 280, 310 | Werribee War Volunteer |
| Inverbroom Air Viola .. | 81875 | 273 | N.C.K. | 5,327 | 6·48 | 345·4 | 270 | Jr. 3 | 297 .. | Banyule Airport |
| Inverbroom Eminent's Empress | 86891 | 273 | N.C.K. | 6,004 | 5·85 | 351·0 | 250 | Sr. 2 | 287 .. | Clarendon Eyre Eminent's Boomerang 4th |
| Inverbroom Empress 7th .. | 67090 | 90 | N.C.K. | 1,530 | 6·48 | 99·2 | 350 | Mature | 310, 385, 432, 424 | Banyule Airport |
| Inverbroom Golden Marie | 76912 .. | 240 (Sold) | N.C.K. | 5,105 | 5·34 | 272·5 | 330 | Sr. 4 | 315, 337 .. | Clarendon Eyre Eminent's Boomerang 4th |
| Inverbroom Miss Empress | 86893 | 273 | N.C.K. | 4,117 | 5·60 | 230·7 | 230 | Jr. 2 | .. .. | Banyule Airport |
| Inverbroom Ruby's Marie | 67091 | 273 | N.C.K. | 11,033 | 4·88 | 538·2 | 350 | Mature | 503, 442, 483, 473 | Inverbroom Marie's Majesty |
| Inverbroom Silvermine's Marie | 44392 | 273 | N.C.K. | 6,963 | 5·28 | 367·9 | 350 | Mature | 429, 455, 495, 476, 589, 478, 402, 357 | Economist of Aveley |
| **Waterhouse, H. W., and Son, Pakenham, Jersey (5).** | | | | | | | | | | |
| Navuloa Master's Stralia .. | 49808 | 273 | 21 | 9,678 | 4·74 | 459·1 | 350 | Mature | 454, 450, 461, 428 | Werribee Grandmaster |
| Ovalau Arctic .. .. | Vol. 31 | 273 | 23 | 6,713 | 5·33 | 357·9 | 230 | Jr. 2 | .. .. | Ovalau Magnet's King |
| Ovalau Chocolate Cream .. | 88383 | 273 | 20 | 7,949 | 5·80 | 461·2 | 250 | Sr. 2 | 361 .. | Ovalau Magnet's King |
| Ovalau Magnite .. .. | Vol. 31 | 273 | 20 | 7,380 | 6·61 | 488·1 | 250 | Sr. 2 | .. .. | Ovalau Magnet's King |
| Ovalau Wyandotte's Cream | 78279 | 273 | 19½ | 7,916 | 5·62 | 445·2 | 350 | Mature | 299, 422, 396 | Brucevale Wyandotte's King |
| **Whelpton, B., Whittlesea, Jersey (3).** | | | | | | | | | | |
| Coodardy Fuchsia .. | 85710 | 273 | 12½ | 6,405 | 5·06 | 323·9 | 310 | Jr. 4 | 269, 250 .. | Werribee Centurion |
| Coodardy Lady .. .. | 85713 | 273 | 15 | 5,328 | 6·01 | 320·2 | 310 | Jr. 4 | 350, 329 .. | Brucevale Lord Rupert |
| Neerod Master's Queen .. | 83107 | 273 | 18 | 5,652 | 6·59 | 372·5 | 330 | Sr. 4 | 442, 327 .. | Navuloa Ladybird's Masterpiece 2nd |
| **Williams, Estate of the late F. A., Bamawm Extension, Jersey (3).** | | | | | | | | | | |
| Bamawn Bonnie Madeira .. | Vol. 31 | 273 | N.C.K. | 6,453 | 5·89 | 380·4 | 230 | Jr. 2 | .. .. | Mornmoot War Hero |
| Bamawm Fancy Garenne 3rd | 85061 | 273 | N.C.K. | 6,311 | 6·70 | 422·9 | 270 | Jr. 3 | 326 .. | Bamawn Ruth's Sultan |
| Warwick True Love 4th .. | Vol. 31 | 273 | N.C.K. | 5,259 | 4·58 | 241·0 | 230 | Jr. 2 | .. .. | Selsey Design's Foremost |
| **Wilson, A., Port Fairy North, Ayrshire (3).** | | | | | | | | | | |
| Lough View Blanche .. | 33867 | 273 | 28 | 5,514 | 4·74 | 261·1 | 350 | Mature | 273, 291 .. | Carracoorte Bobby |
| Lough View Music 2nd .. | 35685 | 273 | 22 | 6,231 | 4·28 | 266·9 | 350 | Mature | 259, 262 .. | Carracoorte Bobby |
| Lough View Rosebloom 3rd | Vol. 37 | 273 | 19 | 5,549 | 3·92 | 217·7 | 250 | Sr 2 | .. .. | Lough View Bell Lad |
| **Woodyer, P. A., Mornington, Jersey (1).** | | | | | | | | | | |
| Carramar Lady Mercedes 4th | 80699 | 273 | N.C.K. | 5,270 | 5·62 | 296·2 | 330 | Sr. 4 | 324, 239 .. | Waioma Viking |

# Fruit Bottling in the Home

By the Fruit Preserving Expert

To retain as many vitamins as possible fruit should be bottled soon after picking. It is unnecessary to buy expensive equipment for fruit bottling. Any type of container that will hold a stand 3 or 4 inches high plus the bottles, and can be fitted with a lid can be used as a sterilizer. It is essential, however, that there should be a good circulation of steam around the bottles. A boiler, copper or kerosene tin may be used as a sterilizer.

Any jar that can be made airtight may be used. A vacuum-pack type of jar is now available. It is a screw-top jar with a metal insert which forms the seal. The fruit is packed in the jars, syrup is added to fill the jar, and the metal insert is placed in position with the rubber of the insert in contact with the rim of the bottle. During processing the lid is screwed on lightly. After processing the lid is removed and the jar overflowed with boiling syrup. The insert is then placed in position and the lid screwed down tightly. Syrup is added to replace the liquid lost during sterilization.

Screw-top jars, with well-fitting lids may be used for fruit bottling. A piece of grease-proof paper is fitted into the top of the lid to prevent the tin from tainting the fruit. The lids are lightly screwed on during processing. When processing is completed the lids are screwed down tightly and immediately inverted in melted mutton fat or candle so that the lids are completely immersed.

Pickle bottles with well-fitting corks also may be used and sealed in this way. They are most useful for small fruits or fruit pulp. The corks should be sterilized with the bottles.

Tins with press-in lids may be used either for pulped or whole fruit. The tin is sealed by pressing the lid down firmly after the fruit has been processed and pouring melted tallow or fat around the groove between the lid and the tin. Patented jars should not be fastened until after sterilization.

The spring clips used on certain types of jar may be adjusted on the jar before or after sterilization, making an equally perfect seal.

### *The Syrup*

The syrup should be prepared in advance. Add 4 to 6 oz. sugar to each pint of boiling water and boil together for five minutes. Strain through muslin for a clear syrup. If the sugar is available, a 6-oz. syrup results in a product of better flavour, although a heavy syrup may cause the fruit to rise in the jars. Honey may be substituted for all or part of the sugar, and in some mildly-flavoured fruits, such as pears, is a decided improvement. Fruit may be bottled in unsweetened water when it is impracticable to obtain a large quantity of sugar at one time, or for use in diabetic diets. When there is a supply of very ripe fruit available, the preserve is greatly improved if some of the ripe fruit is simmered

Suitable sterilizing vessels with wooden platform.

with a little water and sugar to taste, strained and used in place of the sugar and water syrup. Less sugar is required in this method.

### *Procedure*

The platform is placed in the bottom of the sterilizer and sufficient cold water is poured in to come just below the surface of the platform.

Examine the jars, rubber rings, inserts, &c., for flaws before packing the fruit. Prepare the fruit, which should be firm ripe. Peeled fruit should be placed in salted water (one tablespoon to 1 quart water) to prevent them from discolouring. Do not leave in water longer than necessary if flavour is to be preserved.

Pack the fruit firmly into the jars and then rinse under the cold tap to remove any loose pieces of fruit. Cover with cold syrup. Adjust lids on jars and place the jars in the sterilizer. Bring water to the boil and allow to continue boiling vigorously until the fruit is cooked. If doubtful as to time required, test by pressing a sterilized skewer or knitting needle into the fruit. To sterilize the needle, leave it on top of one of the jars in the sterilizer for at least ten minutes.

The jars are lifted out of the sterilizer, one at a time, placed on a damp cloth, overflowed with boiling syrup and sealed immediately.

When the jars are quite cold, test the seal. To do this, loosen clips or unscrew lid and lift the jar by the lid or insert. If the lid has not sealed, examine for flaws, if necessary exchanging for an undamaged article, and re-process over boiling water for ten minutes.

### *Treatment for Various Fruits*

Approximate times only can be given for processing, as they vary according to size of jars and ripeness of fruit, &c.

#### Peaches.

The fruit may be left whole or halved. To halve the cling-stone variety, take a sharp knife and before peeling, cut the fruit right round close to the stone, then twist the halves in opposite directions, when they will separate easily. Then, with a sharp-edged teaspoon, cut out the stone. To peel, dip the fruit in boiling water or, for the hard-fleshed varieties, a caustic soda bath. To each quart of water allow 1 oz. caustic soda, and when the solution is boiling, immerse the fruit, which should be held in a fish basket or an old cloth, for one minute. Rinse thoroughly in cold water, when the skins will rub off.

Cover the peeled fruit with salted water, pack in jars, rinse, and cover with cold syrup. Sterilize the soft varieties for about 30 minutes and the hard-fleshed kinds, 40 minutes.

#### Apricots.

Pack either whole or in halves. Add two tablespoons cold syrup and sterilize 25 to 30 minutes. Overflow with boiling syrup and seal.

#### Pears.

Drop pears into salted water when peeled. Pack and rinse. Cover with cold syrup; the addition of cinnamon or cloves to the syrup is an improvement. Sterilize 30-35 minutes. The winter pears may be given longer.

#### Nectarines.

Nectarines may be halved or left whole. It is not necessary to peel them. Pack in jars, add a little cold syrup and sterilize 25 minutes. Overflow with boiling syrup.

#### Quinces.

Quinces should be peeled and divided into convenient sizes. Drop into salted water as prepared. Pack, rinse well and cover with cold syrup. Sterilize 40 minutes or longer, according to the colour desired. Prolonged cooking gives a deep-pink colour.

#### Plums.

Plums may be halved and the stones removed or they may be left whole. Pack in jars, add two tablespoons syrup and sterilize 25 to 30 minutes. Overflow with boiling syrup.

#### Cherries.

Wash the cherries and remove the stems without tearing the flesh. Pack firmly into jars, add two tablespoons cold syrup and sterilize for 25 minutes. Overflow with boiling syrup.

#### Gooseberries.

It is advisable to bottle gooseberries when green, but not immature. A strong syrup shrivels the skin. Add two tablespoons syrup and, to avoid cracking the skins, sterilize for 20 to 25 minutes at 170° F. (simmering point). Overflow with boiling syrup and seal.

### Raspberries and Loganberries.

Firm fruit should be selected. Wash lightly and quickly, drain and put gently into jars. Place in sterilizer without any syrup, but sprinkle sugar through if desired. Sterilize for 15 to 20 minutes. Overflow with boiling syrup and seal

### Pineapple.

Peel the fruit, remove the eyes and cut into slices of an even thickness, then with a sharp, round cutter remove the centre core. Pack in the jars, fill with cold syrup and sterilize for 45 minutes.

### Fruit Salad.

Peel, core or stone and cut into fairly-even sizes the following fruits, allowing a slightly smaller quantity of the stronger-flavoured fruits:—Pear, apple, peach, apricot, pine-apple, orange, and also, if liked, passionfruit. Pack attractively into jars with a sprinkling of sugar throughout. Bananas may also be sliced and added, but should first be sprinkled with sugar to prevent them from discolouring. Keep them at boiling point for 45 minutes. Overflow with boiling syrup and seal.

## *THE OVEN METHOD OF FRUIT BOTTLING*

Pack the fruit firmly in the jars, and to the top to allow for shrinkage as the fruit cooks. Put in a slow oven (about 240°F.) on cardboard or asbestos. To prevent scorching, place a shallow baking dish or tray over the fruit. Leave until the fruit appears to be cooked and is slightly shrunken. Preservation of fruit by this method takes approximately the same time as fruit baked in a casserole.

Sterilize tops and rings or inserts by putting them in cold water and bringing to the boil and boiling for fifteen minutes; use while hot.

Take the jars out one at a time; place on a folded cloth, and pour in boiling syrup to overflow the brim. Seal immediately with hot sterilized rings or inserts and lids. The jars are not filled with syrup before processing because considerable syrup would bubble over the top. The jars, however, may be partially filled beforehand. Although the appearance of the fruit is not as good when this method is used, the flavour is even better than in the steaming method.


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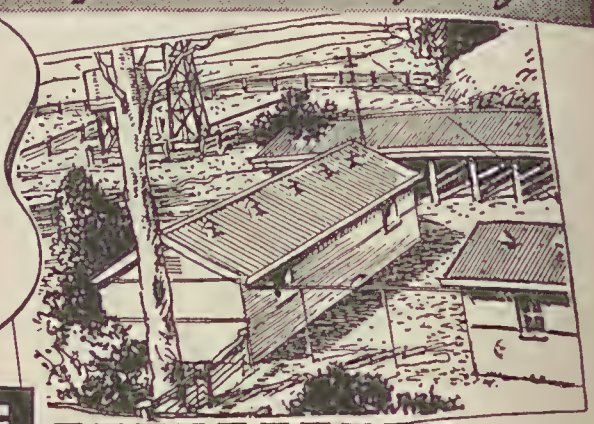

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# Recent Progress in Australian Agriculture

An address broadcast over National Stations by Mr. H. A. Mullett, B.Agr.Sc., Director of Agriculture.

THE progressive development of an industry which produces over £200,000,000 worth of goods annually and which provides 95 per cent. of Australia's annual exportable surplus, as well as the food and the clothing for nearly 8,000,000 Australians, should be of interest to you, but the full story of that development over the years cannot be told at this time. Rather my present purpose is to examine some of the more recent changes in Australian agriculture and the factors which have brought them about, and as we proceed some assessment of whether these changes constitute progress will be possible.

> "Perhaps the stimulus given during the war to mechanization in agricultural industries will be the greatest contribution to permanent progress."

In an industry where you usually can harvest only one crop a year and where animals, despite wishful thinking of their owners, persist in obeying exasperatingly slow natural laws governing the rate of reproduction, and where an occasional drought and a more frequent dry season affect the volume of production, comparisons are seldom valid unless you study periods of 10 to 15 years, and so, this is the period I mean when I use the term "recent" in this talk.

Over the past fifteen years Australian agriculture has stood up to a very heavy battering. First, in the world depression it took the shock of the calamitous drop in prices on the world's markets for its exportable surplus; then followed an era of stalemate when any expansion of production in the staple exportable crops produced a surplus which became a burden on the unfortunate producer and Government alike. Naturally this stultified agricultural development and even held up research and extension work. It was an era of quotas and bounties and regulation of exports, and it ushered in the restriction of production by legislation.

Finally, since the war, the industry has been called upon to produce while lying prostrate on the operating table with several major operations going on at once, involving an amputation here and a grafting there. I refer of course, to the loss of manpower, to transportation restrictions, to freezing of materials and replacement parts, to reduction of the quantity of superphosphate and mill offals available, on the one hand, and to the sudden need to expand the dairying meat, vegetable, potato, and flax industries on the other, and to the relegation of the wheat and the apple industries to a low priority. In the face of these facts no one will argue, I think, that these were optimum conditions for agricultural progress. Therefore, I can tell no tale of triumphant permanent National progress: rather can I point to progress of the kind achieved by Christian in John Bunyan's "Pilgrim's Progress"—to what we have attained by considerable effort against many difficulties, to what has suffered in the process, and to what compensating benefits we may expect.

On the research and investigation side, however, there has been steady achievement, although the work has been much curtailed during the past five years.

Prior to the Japanese attack on Pearl Harbour the advent of war had stabilized agricultural prices for wool, dairy produce, eggs, meat, and dried fruit at about 10 per cent. above the price immediately pre-war, and for the first time for years growers knew their market was assured and that they could produce up to the limit named in the contract with the British Government. Woolgrowers, threatened with competition from artificial fibres, breathed freely once again, because their produce was sold to the British Government for the duration of the war and a year after. On the other hand, wheatgrowers had no such contracts to assist them; instead there were mountains of wheat already accumulated in Canada and U.S.A.; so the Commonwealth Government

Harvesting flax in the Western District. The flax industry has developed considerably under the stimulus of war.

guaranteed the price of wheat subject to the compulsory acquisition and sale of all wheat by a Government agency (the Australian Wheat Board) and to growers agreeing to a compulsory system of control of acreage planted to wheat, together with the licensing of growers and of acreage.

In the case of apples and pears, where the export trade disappeared altogether, the Australian market was faced with the problem of consuming an additional 5,000,000 cases of apples, about double the normal consumption. This would have resulted in a disastrous fall in prices, so a compulsory pooling system was instituted under which such surplus apples and pears as could not be processed were kept off the market.

Our main source of superphosphate disappeared with the capture of Nauru and Ocean Islands, and therefore severe rationing of this vital commodity was necessary. This was indeed a heavy blow, particularly to Victoria. Manpower flocked from the farms to the Forces and the factories. Petrol and motor tyres were rationed. Agricultural implement factories switched over to war work; duplicates and replacements, fencing wire, engines, tools, roofing iron, and so on became difficult to get.

Then from the Allied Forces in Australia and the British Government came calls for more vegetables, more tomatoes, more potatoes, more butter, more eggs, meat (especially pig meat), and more flax. At the same time it was necessary to promote the cultivation of the opium poppy and the production of ergot, so that the drugs morphine and digitalis could be manufactured in Australia.

Allied transport problems were relieved by eliminating, by dehydration, the useless water from meat and vegetables, including, of course, potatoes. Eggs were pulped and dried. Substantial increases were made in the production of condensed and powdered milk; more vegetables and fruit of all kinds were canned for Army needs. To meet conditions in "blitzed" areas in England, the production of cheese was "stepped-up" and a number of new cheese factories erected.

When the supply of vegetable seeds from abroad diminished, the practically non-existent local vegetable seeds industry was stimulated, and has now reached sizeable proportions.

Particular attention was paid to increasing the production of potatoes, for the use of the Armed Forces.

Mills for the treatment of flax are now situated throughout the flax-producing areas. This one is at Ballarat.

In face of tremendous difficulties, due to war and drought, the dairying industry has maintained production at a high level.

The flax industry was expanded considerably to furnish fibre, both for use in Australia and in England, for the manufacture of canvas, hoses, parachute harness, tarpaulins, twine for sewing soles on boots, and so on.

To overcome the shortage of manpower and materials a system of priorities was adopted so that the available resources could be concentrated on to the type of production most needed. Thus, production declined in low priority industries and expanded in industries where the need was urgent.

To eke out manpower, mechanical equipment was imported under lease-lend or manufactured in Australia to assist in the production of vegetables, potatoes, dairying, and restricted in other agricultural industries.

It is of very real interest to see just what has happened to Australian agricultural production under the stress of these various powerful forces which have affected not only the material side of production but also the confidence of many farmers who have never been used to working in an atmosphere of uncertainty and restriction, which naturally tends to undermine initiative. A study of the statistics of production may be most conveniently made by reviewing the average production over successive five-yearly periods, so as to avoid the disturbing effect of seasonal variations. Looked at in this way the dairying industry had shown a remarkably steady and continuous expansion until the last five years, but during this last period there is evidence of a decline. During the five years beginning 1935 the production of butter, cheese, processed milk, and wholemilk for human consumption, all calculated as wholemilk, averaged 1,149,000,000 gallons per annum. During the five years beginning 1939–40 the average figure is practically identical with the previous five years, but the trend in those five years is downwards.

Considering the difficult conditions through which the industry is passing it is surprising that the decline has not been greater, for although the incentive to produce has been stimulated by increased prices, including bounties, there have been powerful factors tending to depress it to which I have already alluded.

Over the years there has been steady expansion in the numbers of live stock kept in Australia, except horses, whose numbers have diminished in recent years in the face of mechanical transport and traction. This expansion has been continued during the war years, especially in sheep, which industry is very economical of manpower. There is also substantial expansion in the poultry industry, where the stimulants are cheap wheat and good prices for eggs.

Just prior to the war potatoes were at low ebb insofar as acreage sown is concerned, but this acreage has been nearly doubled to meet an urgent need by offering contracts at £12 10s. a ton, a price double the pre-war average.

Sheep-owners are assured of a certain market for their wool for the duration of the war and one year after, by agreement with the British Government.

Another crop in which substantial additional production has been attained is flax, an increase from a few acres to over 50,000.

To assist in feeding native populations in the war zone the acreage sown to rice has been increased from 22,000 acres to more than 40,000 acres. Very substantial increases in vegetable sowings have also been made.

Offsetting these gains, the wheat acreage during the war years has steadily declined from 13,300,000 acres to 7,840,000 acres; the barley acreage has fallen from over 800,000 to 400,000 acres; oats by 200,000 acres. In addition, the production of sugar has fallen by about 400,000 tons.

Broadly, the demand has been away from the cheaper forms of carbohydrate foods to foodstuffs richer in protein and fats, though potatoes and rice are exceptions. Apart from vegetables for canning and dehydrating, the other increases have been mainly in crops which it did not pay to grow in Australia before the war. I refer to the production of many types of vegetable seeds, flax, and plants for the extraction of various drugs. After the war this demand will gradually ease and prices will recede, then will come the test as to whether these new crops will remain with us. With efficient methods, no doubt some of them will, and in this the wartime mechanization of the crops should assist in lowering costs. Perhaps the stimulus given during the war to mechanization in agricultural industries will be the greatest contribution to permanent progress, such as dairying, flax, potato-growing, and in the production of vegetables, as this will reduce costs and so stimulate consumption.

For those desiring further information on production in the cereal, dairying and potato-growing industries over the past few years, detailed figures are given hereunder and on the next page.

AUSTRALIAN WHEAT PRODUCTION—(QUINQUENNIAL AVERAGES).

| | Average 1915 to 1919. | Average 1920 to 1924. | Average 1925 to 1929. | Average 1930 to 1934. | Average 1935 to 1939. | Average 1940 to 194. |
|---|---|---|---|---|---|---|
| Acres (thousand) .. .. .. | 10,287 | 9,025 | 11,966 | 15,710 | 12,980 | 11,00 |
| Production ('000 bushels) .. .. | 109,350 | 111,077 | 143,541 | 184,471 | 154,325 | 145,00 |

PRODUCTION FOR THE PAST FIVE YEARS.

| | 1939-40. | 1940-41. | 1941-42. | 1942-43. | 1943-4. |
|---|---|---|---|---|---|
| Acres (thousand) .. .. .. .. .. | 13,300 | 12,600 | 12,000 | 9,300 | 7,80 |
| Production ('000 bushels) .. .. .. .. | 210,000 | 82,000 | 167,000 | 156,000 | 109,50 |

## Australian Dairy Production—(Quinquennial Averages).

| Product. | Average, 1915 to 1919. | Average, 1920 to 1924. | Average, 1925 to 1929. | Average, 1930 to 1934. | Average, 1935 to 1939. | Average, 1940 to 1944 |
|---|---|---|---|---|---|---|
| Butter (tons) .. .. | 80,037 | 98,434 | 125,868 | 170,603 | 195,177 | 172,922 |
| Cheese (tons) .. .. | 10,151 | 11,795 | 13,274 | 15,188 | 21,925 | 31,870 |
| Preserved Milk (tons) .. | 20,018 | 28,887 | .. | .. | 29,826 | 59,024 |
| Total Milk (gallons) .. | .. | 653,190,000 | 800,019,000 | 1,004,734,000 | 1,149,548,000 | 1,149,690,000 |
| Number of Dairy Cows .. | 1,836,000 | 2,206,000 | 2,442,000 | 2,869,000 | 3,380,000 | 3,226,000 |

## Production for the Past Five Years.

| — | 1939–40. | 1940–41. | 1941–42. | 1942–43. | 1943–44. |
|---|---|---|---|---|---|
| Butter (tons) .. .. .. | 203,686 | 185,000 | 160,768 | 164,355 | 150,802 |
| Cheese (tons) .. .. .. | 30,970 | 26,645 | 30,050 | 35,979 | 35,705 |
| Preserved Milk (tons) .. .. | 37,125 | 51,456 | 72,748 | 62,061 | 71,729 |
| Total Milk Produced (gallons) .. | 1,253,000,000 | 1,190,000,000 | 1,104,000,000 | 1,129,000,000 | 1,071,000,000 |
| Number of Dairy Cows .. .. | 3,239,000 | 3,249,000 | 3,247,000 | 3,207,000 | 3,190,000 |

## Australian Potato Production—(Quinquennial Averages).

(Figures supplied by Commonwealth Statistician and refer to year ending 31st March.)

| — | Average, 1915 to 1919. | Average, 1920 to 1924. | Average, 1925 to 1929. | Average, 1930 to 1934. | Average, 1935 to 1939. | Average, 1940 to 1944. |
|---|---|---|---|---|---|---|
| Area Planted (acres) .. .. | 133,000 | 135,000 | 143,000 | 140,000 | 120,000 | 130,000 |
| Production (tons) .. .. .. | 331,000 | 366,000 | 354,000 | 363,000 | 338,000 | 440,000 |

## Production for the Past Five Years.

| — | 1939–40. | 1940–41. | 1941–42. | 1942–43. | 1943–44. |
|---|---|---|---|---|---|
| Area Planted (acres) .. .. .. .. | 105,000 | 123,000 | 100,000 | 140,000 | 181,000 |
| Production (tons) .. .. .. .. .. | 325,000 | 460,000 | 340,000 | 475,000 | 599,000 |

# The Clearing of Trees from Farm Lands

By K. V. M. FERGUSON, M.A., B.Sc., Silvicultural Officer, Forests Commission

CLEARING of trees, scrub, and other forms of vegetation is a natural accompaniment of land settlement and is a necessary feature of rural development. Unfortunately in the past the operation has not always been carried out with discretion, and in many instances has reacted detrimentally not only to individual landholders but also the interests of the State. Any number of examples could be cited of soil wastage and land degradation resulting from wholesale destruction of the protective tree cover. In his own interests the landholder who contemplates any clearing of trees should give the most careful and serious consideration to the possible after-effects on his property and weigh the desirability of retaining at least a proportion of the tree cover as shelter and shade for stock or crops, particularly in exposed localities, or as a safeguard against soil erosion by wind or water. It is easy to destroy, but takes a long time to re-establish a tree crop as many a settler in the past has discovered to his cost.

Shade and shelter requirements of farm livestock should be considered in any tree clearing project.

Individual specimens and clumps of trees retained in paddocks for summer shade, rows and belts preserved along boundaries to give shelter from wind, clumps left to protect the banks of watercourses and other areas liable to erosion, or small patches retained in odd corners to provide future stocks of timber for farm use, take up relatively little space and indirectly more than compensate the farmer for the small proportion of his land lost thereby to pasture or tillage. In planning the farm lay-out to make provision for the most effective disposition of tree cover, it is recommended that expert advice be sought, more particularly where there is any question of obviating possible soil losses from erosion.

It is suggested also in passing that many established farms could be improved, both aesthetically and in production, by the planting of suitable species of trees. Here again expert advice should be obtained in connection with the selection of species to suit different climatic and soil conditions, best methods of planting, and suitable lay-out.

In preparing land for cultivation or pasturage, the landholder in Victoria is often faced with difficulties and expense in effectively clearing the land of trees because of the remarkable tenacity to life of many of the native eucalypts. The faculty possessed by most members of this tree family of producing vigorous coppice shoots after felling or ring-barking may render clearing a costly and tedious business because of the prolonged attention necessary to eradicate the re-growth.

Methods which may be employed for removal of trees are detailed hereunder :—

### *Felling*

Unless the timber is usable or saleable, this process is liable to be laborious and expensive. It involves subsequent measures for suppression of coppice re-growth or grubbing the stumps. It is the method which may be unavoidable for

Trees retained during clearing operations shelter this farmhouse and add to its attractiveness.

removal of small saplings which it would not be practicable to ringbark or to destroy by mechanical methods such as rolling, in which case it is advisable to cut stumps high, say 2 to 3 feet above ground. This tends to render coppice re-growth less vigorous and also less difficult to eradicate.

### *Ringbarking*

The object of ringbarking is to kill the tree by preventing the flow of sap. Sap-ringing or bark-ringing may be used, the former being the more effective in that it severs both the upward and downward channels of sap-flow between the crown and roots. To obtain best results, the cut must be made completely through the live sapwood all the way round the bole, and if properly carried out the tree dies quickly.

Bark-ringing is less expensive and requires less skill with the axe. A strip of bark about 12 inches wide should be removed, and in the case of scarred or otherwise damaged boles, care is necessary to ensure complete severance of the bark. Even the slightest strip of bark left intact is sufficient to keep the tree alive. Bark-ringing does not kill the tree quickly, and some of the Victorian eucalypts — Mountain Grey Gum is one—often recover by developing growth over the exposed wood surface.

Ringbarking does not prevent the growth of coppice shoots below the cut, and in this respect there does not appear to be much difference between the two methods. Ringbarking of course involves subsequent disposal of the dead timber and grubbing of the stumps if the land is required for cultivation.

### *Poisoning*

The object is to kill the tree in such a way as to prevent the growth of coppice shoots, but although generally successful in this respect poisoning may not be 100 per cent. effective. Best results are usually obtained by treatment in late autumn or early winter so far as prevention of coppice re-growth is concerned.

Many chemical preparations for tree poisoning have been tried, but possibly the most effective are arsenical compounds. A prescription prepared from ingredients in the following proportions should give satisfactory results—1lb. arsenious oxide (the white arsenic of commerce), 2lb. washing soda, 4 gallons water. The arsenic is nearly insoluble, and the addition of soda is necessary to convert it to a soluble form readily absorbed by and toxic to plants.

Boil the washing soda and arsenic separately in portion of the water, mix the two solutions thoroughly while still hot, and then add the rest of the water. The boiling should be done out of doors, and care is necessary on the part of the operator to avoid inhaling the poisonous fumes. Thorough mixing is essential.

A farmhouse exposed to the four winds of heaven, the result of over-clearing.

It is hardly necessary to stress that the utmost care should be taken to ensure that children and animals do not have access to the poison solution and that all receptacles should be destroyed or thoroughly cleansed after use.

To apply the solution, the tree is "frill-rung" with the axe near ground level, cutting well into the sapwood, and opening out each cut with a twist of the axe to form a continuous channel round the bole into which the prepared solution can be poured. An old teapot or similar spouted receptacle is convenient for the purpose.

While there is little danger to stock from eating the fallen leaves from poisoned trees or from grazing in areas where poisoning has been carefully carried out, it is advisable to be on the safe side and exclude stock for a few weeks after the treatment.

There is no set rule as to the quantity of solution which should be applied. This is best determined by trial, and will vary considerably with the species, age, vigour, and size of the tree. Small, weakly trees of course require less solution than large healthy ones. It may be found convenient to dilute the stock solution still further.

### *Coppice Eradication*

The only effective method of dealing with coppice shoots is by successive knocking of the shoots as they grow. The growth is gradually weakened until the stump dies. "Bashing" with the back of an axe is the most effective, knocking the shoot close to its junction with the stump and at the same time if possible removing a slab of the stump bark. Small, whiskery shoots are more difficult to deal with than robust shoots which offer more resistance to a blow from the axe. For this reason, shoots should be left for say two years before treatment. The number of successive knockings necessary will depend on the species, size, and vigour of the parent tree.

Expert advice on disposition of shade and shelter belts should be obtained before clearing operations are commenced.

### *Disposal of Ringbarked or Felled Trees*

Those trees or portions thereof which can not be utilized as fuel or for cutting into posts shed poles, or other usable products, are most readily disposed of by burning. Unfortunately records show that the burning-off operations of landholders have in the past been a frequent source of destructive forest and grass fires. The fire hazard in this State in summer time is high, and the serious fires of 1939 and 1944 are fresh enough in the memory to remind everyone of the severe economic losses attributable to this cause. For these reasons, therefore, burning operations at all times must be conducted with the utmost possible care.

Before undertaking the burning of debris resulting from clearing, or indeed any burning operations in rural areas, landholders should remember that they are legally obliged to observe certain precautions, particularly during certain periods of the year. They should therefore acquaint themselves thoroughly with current regulations governing the lighting and control of fires, and are strongly advised to consult the nearest local forest officer for details of any restrictions in force and all conditions which must be observed.

# Seen and Heard—
# In the Pig Industry

By L. A. Downey, H.D.A., Pig Expert

### *Estimating the weight of a Pig*

A PIG breeder was standing on an unloading platform about three feet above the floor of a sale pen at one of the pig markets getting a grandstand view of the sale; with him was a pig dealer who buys and sells as many pigs as a hundred average farmers breed.

The breeder remarked on the good appearance of pigs in the pen nearest to them, to which the dealer replied: "Don't on any account try to value a pen of pigs from this height; get down to the same floor level as the pigs, and you will find that they look lighter than they do from here."

Most pig buyers have an aversion to standing at a higher level than the floor on which the pigs stand, because it upsets their estimate of weights.

Weight estimates on pigs are only opinions, and how they vary, even among the most experienced buyers and judges! Which helps to prove that the only sure indication of pig weights is that given by weighing scales.

Factors said to affect the accuracy of estimates of pig weights include the amount of space around the pigs, that is, pigs look heavier when crowded in a small pen than when spread out in a yard or paddock. Colour is another influencing factor, and a person who is accustomed to working with white pigs is inclined to under-estimate the weight of black pigs. This colour factor probably extends further, making dirty white pigs look lighter than they are, and that is possibly a reason for having white pigs clean when they are submitted for auction sale.

### *Pregnancy in Sows*

Some stud pig breeders have been embarrassed by selling sows which they believed were pregnant, but which subsequently were proved not to be so.

The procedure on most farms is to take note of the service date and then inspect the sows for signs of oestrus 21 days after service, then, in the case of a sow to be sold as "in-pig," it is usual to inspect again 42 days after service.

While such precautions are usually sufficient, in one case which came under notice recently, the sow had no apparent signs of being in season on or about the 21st day after her service nor on the 42nd day after her service, but as an added precaution, because she was sold for delivery to another State, she was placed in the boar's yard on the 42nd day after service, and was again served by the boar.

Although there are a few apparently authentic cases on record of sows which are already pregnant again conceiving and giving birth to two separate litters of pigs at intervals of several weeks, such cases are rare. The sow mentioned above is not likely to be one of those cases but most likely one of those in which the oestrus is not apparent to man but is apparent to the boar, and can be proved only by running the sow with the boar at the time she is expected to be in season if she is not pregnant.

### *Pig Manure*

"There is no manure just as good as pig manure for pumpkins and potatoes," said a farmer at Dandenong, when speaking with pride about his heavy crop of potatoes grown on relatively poor sandy soil enriched with pig manure.

Whatever the relative merits of different animal manures, pig manure has been demonstrated as a useful soil improver for many crops. For this reason a further appreciation of the importance of pig-keeping should develop among farmers with the change-over that is occurring in Australia from exploitative farming to a more balanced system of agriculture. Under the new system soil fertility is maintained or improved through the judicious combination of cropping and animal production in which animal manures are returned to the land.

When pig manure is properly used, the farm where the pigs are raised retains some of its own fertility, and if pig foods are bought, it also gains fertility from the farms where those foods were grown. Each ton of wheat brought on to the farm and fed to pigs has a fertilizer value of about 15s.

### *The Fresh Pork Trade*

It was a pig-buyer for one of the bacon factories who said facetiously to the writer: "What is the pig industry going to do if and when the local fresh pork trade is resumed; will there be enough porker-type breeding stock to produce the light porkers then required?"

The writer replied that he did not consider it a problem because even now, although the majority of pig breeders are trying to breed baconers, there are too many porker-type pigs which at baconer weights are too fat for the best bacon trade. Some of those porker-type pigs occur even in herds where bacon-type has been the objective, and culling has been practised continuously, over a long period.

That inherited characteristic which gives a pig the tendency to fatten when it is a relatively light weight, provided its diet permits, is present in all our breeds of pigs; it may be carried recessively in one pig and become manifest in its progeny.

If pig breeders are skilled in recognition of inherited type-characteristics, and in feeding to control the development of those characteristics, pig production can quickly be adjusted to the changing demands of the pig-meat trade.

# Warning to Wheat-growers

Some wheat-growers may have had difficulty in obtaining seed for this year's crop and it is possible that some inferior wheat at present on the market may be offered for seed purposes. Samples of this inferior grain have been forwarded recently to the Department of Agriculture for examination and germination test. The wheat has a slightly discoloured appearance and appears to have heated in storage. Laboratory tests show that the germination capacity of this wheat is nil—not one grain in a hundred germinated under the favourable conditions of a laboratory test. It is quite obvious therefore that the sowing of such wheat would result in a complete loss. It is understood that the wheat in question is being sold for stock-feed, for which purpose it is quite suitable.

Growers are reminded that wheat for seed may still be obtained. Growers who delivered wheat to Nos. 5, 6 or 7 pool of the Australian Wheat Board may obtain wheat on a redelivery basis by applying to the Grain Elevators Board, 29 Market-street, Melbourne, C.1. Growers who did not deliver to any one of these pools will be permitted to purchase wheat for seed at 6s. a bushel plus freight. Applications should be addressed direct to the Australian Wheat Board, 515 Collins-street, Melbourne, C.1.

# WEEPING WILLOWS

## For Shade—Feed—Timber

By A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

A pleasant bank of weeping willows along the Upper Murray near Bringenbrong.

THE Weeping Willow (*Salix babylonica*) has many uses, which make it a valuable asset on many pastoral and dairy farms. It can be used to prevent soil erosion and to fill up gullies; to provide shade for stock in summer time, and to supply an excellent green feed for dairy cows, poultry, and other stock in the dry summer months, with its foliage and green twigs. The wood makes a good but quick-burning fuel, while from a pictorial standpoint the willow adds beauty to the farm and landscape.

Weeping willows are most useful in undulating country with an annual rainfall of 25 inches or more, although they do well in lower rainfall areas if they are able to get moisture from channels, drains, dams, or other sources. They must have ample water and do best when planted in the winter in gullies where seepage or drainage water is available. Boughs about 9 feet long and 3 inches in diameter are usually planted, and, with sufficient moisture, they grow rapidly. If thin boughs are planted rabbits may ring bark them, and, if too short, the farm animals will prevent them from growing by eating off the shoots.

As soon as willows become established they check the flow of water down gullies, which gradually fill up. On very flat country willows may block the flow of water too much and cause undue flooding. In such cases they may become a nuisance rather than an asset.

Willows provide dense shade and shelter from the summer sun and hot winds, but, being deciduous and therefore bare of leaves in the winter, they are of little value for protecting stock against the cold winter winds.

One of the greatest values of the weeping willow is that it provides an excellent reserve of green feed for stock in the summer when pastures are dry and other green feed is scarce. Stock relish willows and eat every leaf and fine branch that hangs within reach. As a greenstuff for dairy cows, poultry, and other stock, the leaves and twigs have proved very satisfactory. During droughts many willows are lopped for the stock, but, unfortunately, too few are grown for this purpose.

Willow trees stand frequent and severe lopping, although it is wise not to touch the trees during good seasons.

Note how the stock have eaten the lower foliage of this weeping willow.

| | Weeping Willows. | | Mixed Pasture. | |
|---|---|---|---|---|
| | Leaves Only. | Leaves and Twigs. | Succulent. | Flowering. |
| **Chemical Analyses.** | | | | |
| | % | % | % | % |
| Moisture .. | 68·0 | 68·0 | 80·0 | 75·0 |
| Ash .. .. | 3·0 | 2·4 | 2·3 | 2·1 |
| Crude protein .. | 7·5 | 5·2 | 5·6 | 3·7 |
| Crude fat .. | 0·9 | 0·7 | 1·1 | 0·9 |
| Crude fibre .. | 3·8 | 8·2 | 3·2 | 7·1 |
| Carbohydrate .. | 16·8 | 15·5 | 7·8 | 11·2 |
| **Food Values.** | | | | |
| Starch equivalent | 18·0 | 18·0 | 14·0 | 14·0 |
| Protein equivalent | 5·1 | 3·4 | 4·5 | 2·2 |

The chemical analyses and food values of weeping willow leaves, and leaves and green twigs up to ¼ inch in diameter are shown above. For comparison, corresponding figures are shown for mixed grasses and clover pasture in both the succulent and flowering stages.

The chemical analyses and food values of willow leaves and pasture compare very favourably. Higher food values are shown for willows, but this is principally because they contain less water or moisture.

When rationing it is difficult to say what quantity to feed, because the branches are usually lopped and the stock allowed to eat as much of the leaves and green twigs as they desire. It is estimated, however, that up to 20 lb. per day can be fed with pasture hay to each dairy cow with good results.

The quantity to lop daily would have to be worked out in accord with the number of trees available, the number of stock, and the period over which they are to be fed.

Experiments in South Africa have shown that the green weeping willow leaves and fine twigs, as a green food for poultry, are equal to lucerne.

Other varieties of willow are the basket, bat, and the pussy willow. Many of these willows have specific advantages, but they do not combine all the desirable qualities of the weeping willow. Some varieties, such as the pussy willow, can be grown under drier conditions and used to check erosion in gullies, where it is too dry for the weeping willow, but they grow erect and do not provide the same quantity of edible fodder.

The Bat or, more correctly, the White Willow (*Salix alba*), produces a good softwood timber which, although light, is very durable and will withstand rough handling without splintering. For these reasons it is used for making cricket bat blades. Willow timber is used also in a wide range of woodwork, such as poles for scaffoldings on account of its light weight, floors and linings for carts as the planks do not splinter, casings for electric light wires, and beadings of various descriptions.

The bark of most willow species is of some commercial importance for tannery purposes.

Willows are useful in controlling gully erosion.

# Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

VICTORIAN live stock owners are facing a most difficult period on account of the scarcity of supplementary feeds. In the northern districts and central highlands the seriousness of the position is accentuated by a shortage of pasturage as well.

Hay and chaff supplies have never been so short. Grass hay has not been brought under control, but the Chaff Distribution Committee is doing its best to ration chaff to horses doing essential work and to cows producing milk for the whole milk trade. It is estimated that only one-third of the chaff normally handled by merchants is available this year.

Since the outbreak of war, increasing quantities of wheat have been used as stock food and, when fodder rationing was introduced in January, it was being ordered in Victoria at a rate exceeding 25,000,000 bushels per year, a quantity between three and four times that pre-war. A distribution committee, set up at the Australian Wheat Board, 515 Collins-street, Melbourne, is now rationing out less than two-thirds of this quantity to dairy, poultry, and pig farmers.

Flour mills have been restricted to working two shifts and, in some cases, to one shift per day. Until wheat is available to run flour mills on three shifts again, farmers can only expect between one-third and two-thirds of the quantities of bran and pollard which they purchased this time last year. Bran and pollard distribution is controlled by the Department of Agriculture.

Oats and barley supplies are not available and, as oatmeal and pearl barley are not being manufactured; their by-products are not available either.

From the above, farmers should be able to obtain some idea of the stock food position. In the light of this information farmers would be well advised to take note of their fodder reserves, calculate the quantities it should be possible to buy and estimate the growth of pastures and crops such as maize, potatoes and sugar beets which will be harvested in the autumn. The number of live stock which can be carried through the winter can then be estimated and, if there is any surplus on hand, these can be sold at the first opportunity.

The scarcity of normal feeds has created a demand for all manner of by-products which are normally wasted, such as fruit and vegetable peelings, pods and surpluses; grape skins and pips, screenings and husks from all sorts of seeds, &c. Most of these by-products have some food value, as do clippings from hedges and the leaves and twigs of many trees particularly willows and acacias. In the aggregate these by-products may not amount to very much compared with the shortages of hay, grain, bran and pollard but, to the farmers who had the foresight to get a contract for them, they are a boon.

Some of the so-called fodders being sold have little or no food value, and an instance is flax straw-chaff. The seed, seed boll and leaves of the flax plant have a high food value, but the food value of the straw itself is practically nil. If there is a large proportion of grass with the straw as there often is with a crop which has failed, the grass would have the same value as a similar quality grass hay.

It is estimated that there will be about 30,000 tons of potatoes and 2,500 tons of sugar beets available for stock feed this year. The food value of these potatoes and beets will be equal to about 8,000 tons or 300,000 bushels of wheat.

Potatoes are a good feed and may be fed to all classes of stock at the rate of 4 lb. of potatoes to replace 1 lb. of grain. For pigs and poultry, potatoes are best boiled, but they are usually fed raw to other stock. To sheep and cattle 2½ lb. of potatoes will replace 1 lb. of hay or chaff.

Sugar beets are about three-quarters as valuable as potatoes and between 5 lb. and 6 lb. of sugar beets have to be fed to replace 1 lb. of grain. In Europe before the war, sugar beets were being extensively grown to replace mangolds, turnips and other root crops for cattle, sheep, horses and, to a lesser extent, pigs. As the sugar beets will be available only at the Maffra Sugar Beet Factory and as they are bulky, it will be uneconomical to transport them beyond Bairnsdale on the one side and Warragul on the other. Although there is little danger in feeding whole beets, cows which are not used to them should be closely watched while feeding so that any beet which may get stuck in the throat can be quickly removed. The danger is removed if the beets can be grated or sliced.

### *Water Requirements of Farm Animals*

Water for live stock is possibly of greater importance than food, because lack of water causes more rapid deterioration of body tissues than a shortage of food. An animal dies of thirst as soon as it has lost 10 per cent. of the weight of its body in water, whereas 50 per cent. of the proteins and all the fat may disappear without fatal results.

The functions of water in the animal body are principally to soften coarse feeds, and to dissolve the nutrients contained in food stuffs, to transport the digested food in solution to different parts of the body, to remove waste products and to regulate the temperature of the animal.

The question, "How much water do horses, cattle, sheep, pigs or fowls drink in a day?" cannot be precisely answered, because many variable factors, of which temperature, work or exercise, dryness of feed, and level of production appear to be the most important, play a part in determining an animal's capacity for water. Dry cows or sheep on luscious green pasture will drink very little water.

While no general recommendations for drinking any specific amount of water each day can be made, the following figures are the average amounts drunk, and have a value where the erection of storage tanks is contemplated:—

*Horses.*—From 10 to 15 gallons a day.

*Cattle.*—Bullocks and dry cows of about 800 to 1,000 lb. live weight will consume 7 to 10 gallons of water each day, while milking cows require 7 to 10 gallons for maintenance, and about 1½ gallons for every gallon of milk produced. A cow yielding 4 gallons of milk would therefore require 16 or more gallons of water daily. Milking cows will drink up to 10 times a day, and the total amount taken will be more than in the case of cows allowed to drink only 2 or 3 times a day. Calves, which have access to water, in addition to the skim milk they are receiving, usually have a larger appetite and a greater growth rate than calves receiving no water.

*Sheep.*—In hot weather sheep on dry pastures will drink almost 1½ gallons of water a day, while ewes nursing lambs may drink up to 3 gallons.

*Pigs.*—With dry mash, or when self fed, pigs need access to fresh water at all times, otherwise they will not consume sufficient dry feed to make the most rapid growth. The amount of water drunk daily increases from about 3 lb. for 25-lb. pigs to 1½ gallons for fattening pigs of about 200-lb. live weight, and 4 to 5 gallons for suckling sows. Allowance should also be made for waste.

*Poultry.*—Water requirements are greater when the weather is hot, but it is estimated that on an average one gallon is required for every 20 laying hens.

*Dogs.*—When chained up in hot weather dogs should have plenty of fresh, cool, clean drinking water, which should be changed at least twice a day.

Normally animals do not drink in excess of their requirements, and as thirst is the best guide they should, wherever possible, have free access to an unlimited supply of clean fresh water. Animals which are very thirsty and overheated should be allowed to quench their thirsts gradually.

[J. T. Kelly, B.Agr. Sc., Science Field Officer].

### *Dry Cows*

The few weeks that dairy cows are out of production is a most important period in view of the fact that, during this time, they must not only replace body tissues lost during the previous lactation, but also build up reserves for their next lactation. During the first few weeks after calving cows may not receive sufficient nutrients to provide for the amount of milk they are producing, and they are then said to be "milking off their backs", for they must draw on body tissues for milk production, and in consequence they lose flesh.

When a cow calves in low condition she has to produce milk and build up her strength at the same time and, as a result, production suffers. All cows should be in good condition at calving.

The necessity to hand-feed dry cows, frequently referred to as "steaming up", will depend primarily on the season. Given good autumn rains, there may be sufficient green feed in the paddocks to make it unnecessary to provide a supplementary ration. However, if pastures are short, and particularly during the winter, enough additional feed in the form of silage and hay should be fed to keep the cows in the desired condition.

Since supplementary fodders of all kinds will be in short supply on most farms, cows which may have been dry for a considerable period and are already carrying a reasonable amount of flesh should be allowed only sufficient feed to maintain their condition.

[J. T. K.].

### *Don't Sacrifice Brood Sows*

In cases where food shortage necessitates curtailment of pig production, farmers are advised to market pigs at lighter weights rather than sacrifice productive brood sows for slaughter. Given a good season and better supplies of stock foods, those sows and their progeny will all be wanted.

The shortage and uncertain deliveries of wheat are embarrassing pig raisers, and some are contemplating a reduction in their pig stock.

It takes a long time to get a herd of good sows into full production, and past experience has shown that most of the people who go in and out of pig breeding are usually too late in and too late out to derive the benefits of the most favourable food supply and market prices. Such in-and-out pig breeding is not necessary even though the food supply may necessitate some reduction of production.

The Pig Meat Acquisition Plan provides for guaranteed prices for pigs from 101 lb. to 200 lb. dressed weights, and the average weight of baconer carcasses in Victoria is about 160 lb. There is, therefore, scope for reduction in the average weight of baconers slaughtered in necessitous cases.

For a long time there has been an unsatisfied demand for store pigs of baconer and porker weights at prices per lb. above those of baconers. There is also an export market for frozen porker carcasses of 70 lb. to 100 lb., but at prices below those guaranteed for baconers.

[L. A. Downey, H.D.A., Pig Expert].

### *The Importance of Green Food for Poultry*

The importance of feeding fresh, young, and tender chaffed green food to poultry, when kept under intensive conditions, is universally recognized. Many poultry keepers have noticed that, apparently, the birds keep in good condition and health when no green food has been supplied for some little time, but they should realize that this cannot be carried too far, as birds always do better when given green food regularly.

Fowls fed on a simple ration, such as wheat and meatmeal, will consume more green food than when fed on a varied diet consisting of a number of different foods.

It is important that green food be fed to the breeding stock to ensure the maximum production of good healthy chickens.

Green food may be mixed with wet mash or with other systems of feeding, fed separately, or given to the birds at midday or after the grain at night. Not less than 5 lb. or 6 lb. should be provided for every 100 adult birds daily.

For chickens it is necessary that green food should be tender and finely chaffed, and fed

in clean troughs. If this practice is followed, the chickens are not so liable to get crop bound as when the green food is long and stringy. They should receive at least once a day as much green food as they can eat. Outside runs, planted with suitable grasses, are ideal for chickens. Only a portion of the area, separated by wire-netting hurdles, should be available to the chickens at the one time. This will provide fresh areas for other lots of chickens that follow. If they are not able to get out on the grass, a sod of grass brought into the pen will enable them to feed off the young shoots in a natural way.

Some of the green foods which have been used for poultry are green oats, green barley, silver beet, rape, mustard, lucerne, berseem, lettuce, millet, grass, clover, chou moullier, green maize, cabbage and cauliflower leaves.

[H. F. Clinton, Poultry Expert].

### *Treatment for Roundworms in Poultry*

The flock or mass treatment recommended against roundworms in poultry consists of the administration of nicotine sulphate (Black Leaf 40) in the mash.

Sufficient of the mixture to treat 25 pullets about four months old can be prepared by adding to 4 lb. of dry mash one pint of water to which has been added 2 cubic centimetres (½ teaspoon) of nicotine sulphate. This must be mixed thoroughly through the mash to ensure even distribution.

Treatment should be continued for seven days, with further seven-day periods of treatment at intervals of one month if found necessary.

The treated mash should be left readily accessible to the birds all day, and should be prepared fresh on each of the seven days. Any unconsumed mash should be discarded each night. Green food should be given at midday, and the droppings should be collected each day during the treatment and burnt.

Varying results may be obtained from such mass treatment. The most heavily affected birds because of the depressed appetite, which is often a symptom of heavy infestation, may not consume sufficient of the mixture to have any appreciable effect on the heavy infestation present. In such cases individual treatment with carbon tetrachloride should be tried. The dose for individual birds is 1 cubic centimetre, and the dosing should be carried out by means of a suitable gun or syringe.

Following either mass or individual treatment, it is of the utmost importance to prevent, as far as is possible, reinfestation.

During treatment, or after individual dosing, birds should be kept shut up, preferably in houses in which wire-netting frames have been placed over the floors. This will allow the worms and worm eggs which are voided to be collected from the floor and destroyed.

As routine procedure in worm control, the following can be recommended:—Yards should be spelled for a portion of each year, and chickens should be placed on new ground, or at least on ground to which adult birds have not had access for many months. Failing this, the surface soil to a depth of 2 inches should be removed from the chicken run and replaced with fresh soil.

Green feed fed to chickens should not be from a plot which has been treated recently with fresh fowl manure, as such feed may be heavily contaminated with worm eggs.

Food and water troughs should be so arranged as to avoid contamination of their contents by droppings.

Strict attention to hygiene, feeding an adequate and suitable ration, the avoidance of over-crowding, and the provision of large open runs are all important factors in any scheme for the control of worm infestation in poultry.

[A. R. Grayson, B.V.Sc., Veterinary Officer].

### *Bee-keeping*

With the honey season drawing to a close, weak colonies should be examined, and where the bees have failed to gather a surplus sufficient to carry them through the winter, they should be assisted by transferring combs containing sealed honey from colonies that have stored a surplus greater than their winter requirements. This operation should be carried out before commencing the final extraction from the stronger colonies. The quantity of sealed honey given to a weak colony should be governed by the covering capacity of the cluster of bees within the hive. The hive entrances of weak colonies should be contracted to a space of not more than 2 inches in width, and all lids snugly and securely fitted.

Migratory bee-keepers with bees working on grey box and yellow gum blossoms should extract all unsealed honey, and remove their bees from the vicinity of the bloom not later than the end of the month. Water saturated nectar

gathered from these sources during winter months has often proved to be the primary cause of heavy mortality of bees during the early spring.

Coastal sites should be occupied as early as possible, choosing a position protected from the prevailing winds. The coastal areas, compared with higher inland altitudes, are warmer, and not subject to such heavy frosts—enabling the bees to indulge in cleansing flights at comparatively short intervals during the winter.

[J. W. Thomlinson, Apiary Inspector].

# Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

| Name. | Address. | Name. | Address. |
|---|---|---|---|
| Abrahams, L. J. .. .. | Red Hill South | Haywood, Dr. A. R. .. | Hastings |
| Baker, J. J. .. .. | Bannockburn | Horn, L. A. .. .. | Leongatha North |
| Beechy, K. .. .. | Pomborneit | Jackson, Wm. C. .. | "Patterdale" Stud, Main Ridge |
| Bidgood Bros .. .. | Staghorn Flat | Longerenong College .. | Dooen |
| Bodey, A. A. .. .. | "Bonnyview," Dooen | Noble, T. M., and Sons .. | Maffra |
| Bright, George H. .. | Dumbalk | Northcote Children's Farm | Bacchus Marsh |
| Buller, R. A. .. .. | Beaconsfield | Rintoul, J. T. C. .. | Glengarry |
| Castle, L. H. .. .. | Clarinda | Roy, W. A. .. .. | Morrell's Hill, via Boolarra |
| Critten, H. S. .. .. | Dumbalk | State Experiment Farm | Rutherglen |
| Dookie Agricultural College | Dookie | Trenery and Soderlund .. | "Promview," Foster |
| Doornbusch, John L. .. | "Starpark," Nhill | Trigg, A. J. .. .. | Bungaree |
| Ellwood, A. H. .. | Paschendaele | Trigg, N. H. .. .. | Bullarook |
| Fairchild and Clutterbuck | Tinamba | Tweddle, J. T. .. .. | "Winlaton," Shepparton |
| Hamblin, A. T., and Sons | Toolleen | Warry, A., and Sons .. | Delburn |
| Hardinge B. and Sons .. | Nar Nar Goon | Whelpton, B. .. .. | Whittlesea North |
| Harrison, C. T. .. | "Eastside" Stud, Pomborneit | White, G. W. .. .. | Boolarra South |
| Hawtin, I. E. and F. .. | "Rossmoyne," Colac | | |

# Fistulous Withers in Horses

By G. NICOL, B.V.Sc., Veterinary Officer

FISTULOUS withers is a relatively common condition of horses. It may first be noticed by the owner as an unpleasant-looking festering mass which may completely interfere with any use being made of the horse.

An advanced case of fistulous withers.

One cause of fistulous withers is a small thread-like worm which usually lives in the connective tissue of its host, often giving rise to the formation of firm nodules of connective tissue in which the worms lie coiled up. Another cause is the organism known as *Brucella abortus,* which is commonly associated with abortion and sterility in cattle. In some cases both the worm and this bacterial infection occur together. Another type of bacterial infection associated with fistulous withers is that due to a streptococcal infection.

It is not known how long the initial swelling takes to become apparent after infection is acquired. The development of a fistula is dependent on various predisposing factors such as mechanical injury as occurs with bruising, badly fitting collars and saddles, or bites of other horses, all of which may effect some degree of damage to the tissues in this area. When such damage is followed by infection a fistula is formed and develops. At first there may be some degree of pain and slight swelling on one or both sides of the midline. Working horses may resent the fitting of a collar or show great pain when handled about the withers. Subsequently the swelling may come to a "head" and burst in several places, from which exudes the pus associated with the infection. This pus in many cases may drain only very incompletely from the natural orifices and come to burrow downwards below the shoulder where it may lodge in a pus pocket near the level of the elbow. In many cases it is impossible to determine by probing the extent of this spread. Often some of the natural openings will heal while other openings occur due to the formation of secondary abscesses.

The method of infection varies. With the Brucella infection the organisms are taken in by mouth from contaminated pasture; this contamination may be associated with cows infected with *Brucella abortus;* infection cannot be spread from horse to horse unless the fistula is discharging in which case pasture and soil contamination occurs; saddles likewise are not likely to convey infection from one animal to another unless there is a discharging wound present. The worm infestation comes about through the agency of a biting insect, a midge or sandfly which may be present in the warmer months of the year and can transmit the infestation from one animal to another. Paddocks which have harboured infected cattle or other horses affected with discharging lesions will retain the infection for up to several months after stock have been removed.

Generally speaking the chances of recovery are not good in long-standing cases. The

[*Continued on page* 164.

# Seed Potato Certification

## List of Growers, 1945

By G. H. MATTINGLEY,
Potato Expert

DURING the years in which the Seed Potato Certification Scheme has been in operation in Victoria, the aim has been to identify these crops which by virtue of their trueness to type and freedom from disease, are eminently suitable for seed purposes.

Crops are inspected at least twice in the field, the tolerance at the final inspection being 2 per cent. diseased plants and/or ½ per cent. varietal admixture. Before leaving the farm the tubers are critically examined and each bag is labelled and stamped with the Government seal.

It is stressed that seed potatoes, whatever their origin, cannot be regarded as "certified" if they are not contained in a sealed bag bearing an official label signed by the certifying officer.

Sales of certified seed may be made by direct negotiation between buyer and seller, subject to a Potato Sales Permit obtainable from the Deputy Potato Controller, 370 Little Collins Street, Melbourne, or any potato inspector.

The list hereunder gives particulars of all crops which have passed the final field inspection :—

LIST OF GROWERS OF PROVISIONALLY CERTIFIED SEED POTATOES, 1945.

| Name. | Address. | Acres. |
|---|---|---|
| **EARLY CARMAN.** | | |
| Allan, J. M. and R. | Wheelan's L. B., Leongatha | 15 |
| Chalmers D. M., jun. | "Stonehaven", Leongatha | 6 |
| Collery, Jas. | Kerrie, via Romsey | 10 |
| Collery, John | Hesket, via Woodend | 10 |
| Coulter, E. and W. L. | McKinnons P.O., via Leongatha | 4 |
| Coulter, R. | Nichol's-road, Leongatha | 4½ |
| *Crozier, G. S. | Newham | 3 |
| Foy Bros. | Mirboo North | 7 |
| Gunn, H. F. | Thorpdale | 3½ |
| Gunn, Norm | Thorpdale | 8 |
| Hassett, J. T. | Leongatha | 4 |
| Lester, F. and A. | Leongatha | 8 |
| MacRae, E. and J. | Narracan East | 12 |
| Mayall, R. H. | Nichol's-road, Leongatha | 10 |
| Mayo, L. C. | Thorpdale | 12 |
| McBeth, J. | Neerim-road, Carnegie | 3 |
| McGrath, W. J. | Stony Creek | 11 |
| McIndoe,, J. A. | Leongatha | 5 |
| Miller, G. L. | Amey's Track, via Foster | 3 |
| Morter, H. | Leongatha | 10 |
| Powell, H. and Sons | Thorpdale | 30 |
| Redman, A. L. | Leongatha | 2 |
| Thorson, T. E. | Stony Creek | 5 |
| *Vance, E. S. | Newham | 2 |
| White, J. | "Elnaam," Neerim | 2 |
| **LATE CARMAN** | | |
| Barker, L. G. | Weeaproinah | 3 |
| Benson Bros. | McDevitt, via Colac | 4 |
| Brown Bros. | Wyelangta | 7 |
| Brown, D. B. | Wyelangta | 4 |
| Butler, J. | Weeaproinah | 5 |
| Clements, C. E. | Hesket, via Woodend | 45 |
| Collery, Jas. | Kerrie, via Romsey | 11 |
| Collery, John | Hesket, via Woodend | 7½ |
| Congram, W. J. P. | Beech Forest. | 4 |
| *Crozier, G. S. | Newham | 3 |
| D'Arcy, F. F. andJ. S. | Greendale | 18 |
| Dyball and Searle | Kinglake | 5 |
| Easdown Bros. | Kinglake Central | 23 |
| Ebbels, J. T. | Olinda | 12 |
| Else, J. F. | Romsey | 15 |
| Exton, Arnold | Pheasant Creek | 5 |
| Exton, A. P. | Pheasant Creek | 2 |
| Exton, C. and Sons | Kinglake Central | 135 |
| Francis, J. E. | Ferguson | 2 |
| Fry, J. G. | Beech Forest | 4½ |
| Gardner, G. J. | Beech Forest | 10 |
| Gardner, R. W. | Beech Forest | 6 |
| Gray, J. R. | Beech Forest | 8 |
| Grosse, H. G. | Beech Forest | 13 |
| Gunn, Norm. | Thorpdale | 7 |
| Harris Bros. | Cockatoo | 25 |
| Hawkins, E. T. | Kinglake | 21 |
| Hobson, J. T., and Son | Laver's Hill | 6 |
| Hotchkin, H. A. | Thorpdale | 3 |
| *Jeffery, E. E. | Toolangi | 2 |
| Johnson, J. L. | Wyelangta | ½ |
| Kelly, J., jun. | Pheasant Creek | 3 |
| Knox, J., and Son | Weeaproinah | 10 |
| Lawrey, L. K. | Kinglake Central | 17 |
| Maggs and Neumann | Box 32, Ringwood | 15 |
| Meehan, B. P. | Webster's Hill | 4 |
| Minchinton, F. J. | Ferguson | 11 |
| McMahon, J. P. | Kinglake | 2 |
| O'Brien Bros | Weeaproinah | 18 |
| Owen, F. J., and Son | Pheasant Creek | 5 |
| *Parker, S. | Ferguson | 2 |
| Pearce, A. E. | Webster's Hill | 2 |
| Rosato, G. | Wyelangta | 2½ |
| Schultz, A. | Beech Forest | 1 |
| Skinner, F. T. | Ferguson | 9 |
| Smith, J. and Sons | Stalker | 2 |
| Stewart, G. C. | Box 65, Yarragon | 4 |
| Stewart, J., and Sons | Trafalgar | 5 |
| Symonds and Ricardo | Hoddles Creek | 20 |
| Tann, W. H. | Weeaproinah | 20 |
| Thom, J. R. | Kinglake Central | 15 |
| Toohey, D. J. | Pheasant Creek | 12 |
| Toohey, J. | Pheasant Creek | 4½ |
| Toohey, L. F. | Kinglake | 36½ |
| Toohey, T. J. | Kinglake | 18 |
| Towers, A. J. | Beech Forest | 6 |
| *Townsend, J. O. A. | Ferguson | 2 |
| Trewhella, A. B. | Newham | 23 |
| *Weston, C. | Beech Forest | 2½ |
| White, J. | "Elnaam", Neerim | 8 |
| *Young, A. E. | Beech Forest | 2 |
| Young, R. and A. | Weeaproinah | 6 |

* No seed for sale.

| Name. | Address. | Acres. |
|---|---|---|
| **UP-TO-DATE.** | | |
| Benson Bros. .. | McDevitt, via Colac .. | 16 |
| Brown Bros. .. | Wyelangta .. .. | 7 |
| Brown, D. B. .. | Wyelangta .. .. | 5 |
| Butler, J. .. .. | Weeaproinah .. .. | 4 |
| Cartiere, G. .. | Wyelangta .. .. | 7 |
| Congram, W. J. P. .. | Beech Forest .. .. | 24 |
| Deppeler Bros. .. | Beech Forest .. .. | 28 |
| Johnson, J. L. .. | Wyelangta .. .. | 3½ |
| Knox, J., and Son .. | Weeaproinah .. .. | 4 |
| *Lee, J. A. .. .. | Laver's Hill .. .. | 2 |
| McBeth, J. .. .. | 207 Neerim-road, Carnegie .. | .. |
| McMinn, H. G. .. | Wyelangta .. .. | 6½ |
| Perry, J. A. .. | Beech Forest .. .. | 11 |
| Rosato, G .. .. | Wyelangta .. .. | 1½ |
| Simmons, J. C. .. | Wyelangta .. .. | 3 |
| Tann, W. H. .. | Weeaproinah .. .. | 10 |
| Webster, S. .. .. | Laver's Hill .. .. | 5 |
| **SEBAGO.** | | |
| Boustead, A. C. .. | Dean .. .. .. | ½ |
| Chapman, W. W. .. | Gordon .. .. .. | 3½ |
| Giles, A. W., and Son | Koo-wee-rup .. .. | 23 |
| Heffernan, D. .. | Chapple Vale .. .. | 1 |
| Knox, J., and Son .. | Weeaproinah .. .. | 7 |
| Labbett, Bros. .. | Clarke's Hill .. .. | 1 |

| Name. | Address. | Acres. |
|---|---|---|
| **SNOWFLAKE.** | | |
| Boustead, A. C. .. | Dean .. .. .. | 45 |
| Chapman, W. W. .. | Gordon .. .. .. | 25 |
| Clements, C. E. .. | Hesket, via Woodend .. | 40 |
| Collery, Jas. .. | Kerrie, via Romsey .. | 4½ |
| Collery, John .. | Hesket, via Woodend .. | 4½ |
| Dalziel, J. C. .. | Clarke's Hill .. .. | 24 |
| Foran, H. .. .. | Waubra .. .. .. | 10 |
| Gooch Bros. .. | Wheatsheaf .. .. | 18 |
| Labbett Bros. .. | Clarke's Hill .. .. | 36 |
| Leggo, E. G., and J. R. | Italian Hill, Daylesford .. | 22 |
| McBeth, J. .. .. | Neerim-road, Carnegie .. | 20 |
| Rothe, F. .. .. | Little Hampton .. .. | 24 |
| *Spurling, W. .. | Trentham .. .. | 2 |
| Stewart, G. C. .. | Box 65, Yarragon .. .. | 1½ |
| *Toomey, E. .. | Trentham .. .. | 4 |
| **KATAHDIN.** | | |
| Arundell and Harrington | Glen Aire-road, Laver's Hill .. | 4 |
| D'Arcy, F. F., and J. S. | Greendale .. .. | 6 |
| Foran, H. .. .. | Waubra .. .. .. | 13 |
| Giles, A. W., and Son | Koo-wee-rup .. .. | 10 |
| Grosse, H. G. .. | Beech Forest .. .. | 3 |
| Knox, J., and Son .. | Weeaproinah .. .. | 6 |
| Launer, G. F. .. | Beech Forest .. .. | 2 |
| McGrath, W. J. .. | Stony Creek .. .. | 4 |
| Sinclair, E. S. .. | Stony Creek .. .. | 2 |

* No seed for sale.

## FISTULOUS WITHERS IN HORSES—*continued from page 162*

condition is always troublesome and difficult to treat particularly where there is some deep-seated necrotic tissue. When the tops of the vertebrae or other bony tissue become involved, the case is much more serious, partly because of the depth of the lesions and inaccessibility and partly because of the tendency of bony tissues to develop further necrotic areas even after the surface has been curetted or scraped. When pus formation occurs along the inner surface of the shoulder blade it may be impossible to locate the extent of the infection and very radical surgery may have to be resorted to. Many cases appear to clear up for a time only to reappear later.

Diagnosis and summation of the extent of tissue damage and infection are important before treatment is proceeded with. The use of antiseptic and caustic injections is usually of little use in clearing up the trouble. Where the fistula is quite small and has not involved any deep structures simple surgery in the form of incision and drainage is usually employed. This may be combined with the use of sulphanilamide powder in the case of a streptococcal infection.

Where examination reveals a deep-seated source of infection, the so-called radical operation for fistulous withers is necessary and involves the removal of large areas of tissue in order to eliminate all traces of damaged and infected tissues.

# VICTORIAN F.A.Q. WHEAT

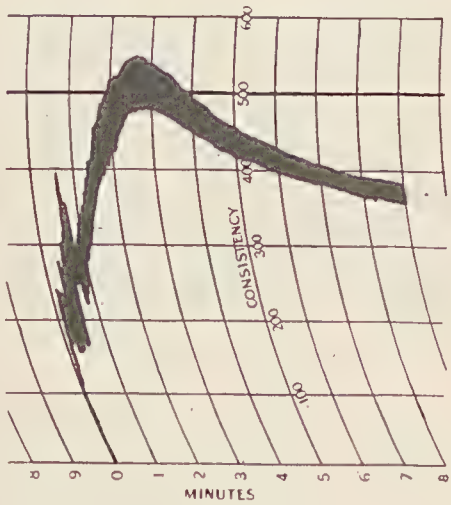
## Analysis of 1945 Sample

By E. J. O'BRIEN, A.A.C.I., Cereal Chemist

A portion of the official F.A.Q. wheat sample, made available by the Victorian Chamber of Commerce, has been critically examined as in previous years. The results of analysis and of milling and baking tests, together with the results for the previous seven years, are tabulated below.

As a consequence of the acute drought conditions which have prevailed over the major portion of this State, the wheat harvest for this year is estimated at less than four million bushels, of which less than one million bushels have been delivered, the remainder being retained for seed and feed purposes.

Since the average normal crop is approximately 36,000,000 bushels and since the number of stations contributing to this sample is much smaller than usual, it can be readily appreciated that this season's F.A.Q. wheat sample cannot be easily compared with those obtained in normal years, nor can the results of examination give any indication to millers of the quality of wheat likely to be delivered, because of the fact that very little of the wheat as represented by this sample will be available for milling.




Farinogram for 1945 sample of F.A.Q. wheat.

TABLE I.—ANALYTICAL RESULTS.—WHEAT.

| — | 1938. | 1939. | 1940. | 1941. | 1942. | 1943. | 1944. | 1945. |
|---|---|---|---|---|---|---|---|---|
| Moisture (per cent.) .. .. | 11·8 | 9·1 | 10·7 | 11·0 | 10·5 | 11·2 | 11·2 | 11·8 |
| Impurities (screenings) (per cent.) .. | 5·3 | 3·4 | 4·1 | 3·8 | 5·3 | 3·7 | 4·9 | 4·1 |
| Ash (per cent.) .. .. .. | 1·30 | 1·26 | 1·43 | 1·20 | 1·23 | 1·20 | 1·20 | 1·19 |
| Protein (N x 5·7) (per cent.) .. | 11·09 | 12·81 | 9·78 | 11·74 | 10·28 | 11·10 | 10·40 | 11·50 |
| Bushel weight (lb.) .. .. .. | 63½ | 64½ | 63½ | 64¼ | 63¾ | 64¼ | 65 | 63½ |
| Pelshenke Figure (lb.) .. .. | 28 | 36 | 26 | 39 | 32 | 33 | 37 | 35 |

### *Wheat*

The sample was bright and the grains were fairly well filled, as is indicated by the bushel weight of 63½ lb., which, although lower than the preceding four years, is still satisfactory. The softer wheat varieties predominate in this year's sample and the dockage percentage is normal, consisting mainly of small and broken grain, husk, straw and some weed seeds; the reported dockage (screenings) includes all grain less than 2 m.m. diameter. A disturbing feature of the dockage analysis is the presence of seeds of *Brassica tournefortii* (long fruited Wild Turnip). This seed is listed under the Victorian Seeds Act as a totally prohibited weed seed, and its presence in the F.A.Q. wheat, although possibly a result of the abnormal season, may indicate that the spread of this weed in Victoria is assuming serious proportions.

TABLE II.—ANALYTICAL RESULTS.—FLOUR.

| — | 1938. | 1939. | 1940. | 1941. | 1942. | 1943. | 1944. | 1945. |
|---|---|---|---|---|---|---|---|---|
| Moisture (per cent.) .. .. | 11·6 | 11·1 | 12·6 | 12·4 | 13·2 | 13·6 | 13·4 | 13·4 |
| Yield (per cent.) .. .. .. | 73·8 | 71·3 | 72·9 | 73·2 | 70·0 | 71·7 | 70·0 | 72·0 |
| Ash (per cent.) .. .. .. | 0·48 | 0·54 | 0·48 | 0·47 | 0·48 | 0·46 | 0·40 | 0·44 |
| Protein (N x 5·7) (per cent.) .. | 9·92 | 11·17 | 8·78 | 10·43 | 9·04 | 10·00 | 9·03 | 10·30 |
| Wet Gluten (per cent.) .. .. | 30·4 | 38·7 | 28·8 | 30·8 | 25·7 | 30·0 | 28·0 | 35·0 |
| Dry Gluten (per cent.) .. .. | 9·9 | 12·2 | 9·5 | 10·4 | 8·6 | 10·1 | 9·4 | 10·9 |
| Water Absorption— | | | | | | | | |
| Hand (per cent.) .. .. | 50·6 | 50·0 | 50·2 | 52·5 | 51·5 | 52·0 | 51·0 | 55·5 |
| Farinograph (per cent.) .. .. | 54·5 | 63·0 | 57·4 | 61·8 | 57·5 | 57·5 | 55·4 | 59·6 |
| Maltose Figure (mgrms Maltose per 10 grms.) | 152 | 168 | 155 | 152 | 142 | 110 | 108 | 107 |
| Valorimeter No. (Farinograph) .. | 34 | 46 | 42 | 44 | 38 | 39 | 39 | 38 |

The protein content (11.50 per cent.) is higher than usual, and its quality as measured by the Pelshenke figure is of the same order as that of the preceding few years.

## *Flour*

The cleaned wheat, conditioned to 15 per cent. moisture, milled freely to give a normal yield of clear, bright flour of low ash content. The maltose figure is low (107) like that of the preceding two years, but this fault can be rectified by diastatic additions in the form of malt extract or malt flour. The gluten content is higher than usual and results from the abnormal season.

The flour was tested on the Brabender Farinograph, and the diagram obtained is shown in the illustration. The curve shows a rather long mixing period with fair stability and elasticity and generally represents a satisfactory baker's flour. This contention is borne out in the results of the standard baking tests given in Table III.

The basic loaf possessed a pale crust and was immature; the malt phosphate addition resulted in a marked improvement in volume and appearance, indicating that with this season's wheat, as with the preceding one, material improvement can be effected by the use of yeast foods and diastatic additions. A further improvement resulted from the addition of bromate, the volume being the highest yet recorded for Victorian F.A.Q. The appearance of the loaf both as regards crust and crumb was excellent, and if wheat of the quality of this season's F.A.Q. was available in quantity, a very excellent baker's flour would result.

Normal yields of bran and pollard were obtained, both of which were found to have an analysis complying with their respective standards under the Stock Foods Act.

TABLE III.—STANDARD BAKING TESTS (100 GR. FLOUR).—LOAF VOLUME IN C.C.

| — | 1938. | 1939. | 1940. | 1941. | 1942. | 1943. | 1944. | 1945. |
|---|---|---|---|---|---|---|---|---|
| Basic .. .. .. .. | 450 | 397 | 392 | 442 | 440 | 440 | 405 | 425 |
| Basic + malt + phosphate .. | 510 | 475 | 460 | 517 | 475 | 490 | 475 | 494 |
| Basic + malt + phosphate + bromate | 490 | 517 | 497 | 561 | 460 | 505 | 515 | 592 |

# Burnley Egg-Laying Competition

## Final Results, 1944-45

By H. F. CLINTON, Poultry Expert

THE thirty-fourth Egg-laying Competition for fowls, conducted at the School of Primary Agriculture and Horticulture, Burnley, commenced on 1st April, 1944, and concluded on 2nd March, 1945, a period of 48 weeks.

The Single Test Competitions continue to be well supported by breeders, as the whole of the accommodation provided for this competition was filled. The accommodation consisted of 236 pens, each housing one bird.

As was the case in this year's competition, it is pleasing to note that for the 1945-46 competition, which has just commenced, many more applications were received than could be accepted for the accommodation available. This support indicates that the competition is appreciated by breeders.

Owing to the man-power situation, the competition as from 1942-43 has been limited to Section "B," Individual Birds, Single Test, eliminating Section "A," groups of six birds, trap-nested. This has resulted in a great shortage of pens required by competitors.

This Australorp, owned by Mr. C. E. Graham, Portarlington, was top scorer of the competition with 301 first-grade eggs.

Head of the champion bird. Note the well-shaped head, and bright eye.

For the 1945-46 competition, which has just commenced, applications were received for a total of 636 pens, for 636 birds, and 400 birds had to be eliminated by ballot.

The beneficial effect of the competition on the industry as a whole is widely recognized. The introduction to commercial poultry farms of the progeny of birds which have distinguished themselves at Burnley, has greatly improved the quality of Victorian flocks generally, and the size of eggs produced.

Victorian conditions are well-suited for egg-production, and large numbers of fowls, principally White Leghorns, Australorps, and to some extent, Rhode Island Reds, are kept for this purpose on commercial farms, and also as an adjunct to other branches of farming. There are many poultry farmers with approximately 1,000 birds, and a number of large, commercial egg-producers, each running from 3,000 to 20,000 laying birds.

The estimated gross value of poultry and eggs produced in Victoria during the twelve months ended 30th June, 1943, was £7,322,154, or approximately £3 14s. 4d. per head of the population.

Large demands are now being made upon the poultry industry of Victoria, in respect to eggs in shell, processed eggs, and for table poultry. The prices recently received for eggs have been satisfactory.

Left—Mrs. K. C. McKenzie's White Leghorn, winner of Class 1 with a total of 287 first-grade eggs.
Right—The Class 2 winner, a White Leghorn owned by Goulburn Valley Stud, 282 first-grade eggs.

Although at the end of the 48 weeks' period of the competition just concluded, no bird had laid a sufficient number of eggs to enable it to qualify for retention for the full twelve months in an attempt to break the present Burnley egg-laying record, some good scores were recorded.

The Burnley competition was inaugurated in 1911, and the highest twelve months' record for a single bird of any breed since that date was made by an Australorp entered by Mr. F. W. Becker in the 1940-41 competition. This bird laid a total of 340 first-grade eggs in 52 weeks, and 312 in 48 weeks.

In the 48 weeks-period of the competition, just concluded, the best performance, and one of outstanding merit, was that of an Australorp, owned by Mr. C. E. Graham. This bird laid 301 eggs, all of which were first-grade, the highest score in all classes of the competition. Mr. Graham has been a competitor in the Burnley Competitions for many years, and it can be recalled that a Black Orpington (now known as Australorp) entered by him in the 1917-18 competition laid 335 eggs in twelve months. The weight of these eggs averaged 26½ oz. to the dozen. This score was a Burnley record for a number of years, but has since been exceeded by five first-grade eggs. Some other birds entered in the class for Australorps also laid very good scores.

Some good performances were achieved by White Leghorns. A bird of this breed entered by Mrs. K. C. McKenzie, in the Wet Mash Class, and one entered by the Goulburn Valley Stud (J. E. Coupar), in the Dry Mash Class, laid 287, and 282 first-grade eggs respectively. Other White Leghorns in these classes also laid well.

A White Wyandotte entered by Mr. D. Granter, laid 272 first-grade eggs, an excellent score for this breed. A Rhode Island Red owned by Mr. E. Ikin laid 242 eggs, all first-grade, a Light Sussex owned by Mr. T. Hinton laid 238 first-grade eggs, and an Ancona owned by the Nest Poultry Farm (M. Hanham) laid a total of 226 eggs, all first-grade. As a result of the ballot, many of the well-known breeders were prevented from competing.

Rhode Island Reds were represented by 24 birds.

The mortality among the competing birds was 5·5 per cent. As it is in the interest of all poultry breeders to improve their flocks and reduce mortality, competitors should exercise special care in the selection of the stock used to produce birds for egg-laying competitions, and breed only from those possessing a high degree of constitutional vigour.

In the competition, prize certificates and sashes were awarded for the greatest number of first-grade eggs laid. During the first two months of the competition a first-grade egg must weigh not less than 1¾ oz., and thereafter not less than 2 oz. At Burnley, every egg is weighed to one-tenth of an ounce. The records are available for examination by any competitor.

## *The Awards*

### Single Test.

In the class for White Leghorns fed on wet mash, first prize was won by Mrs. K. C. McKenzie, and she was also awarded a second prize Burnley Sash, with a bird that laid 287 first-grade eggs. Mr. L. J. Jackson gained second prize with a bird that laid 273 eggs, and Mr. A. McIlvain obtained third prize for a bird with a total of 272 eggs.

In the White Leghorn class fed on dry mash, first prize was won by the Goulburn Valley Stud (J. E. Coupar), and this competitor was also awarded a third prize Burnley Sash, with a bird that laid 282 first-grade eggs. Second and third prizes went to Mr. J. Robertson, these two birds laid 272 and 270 eggs respectively.

In the class for All Light Breeds other than White Leghorns, The Nest Poultry Farm (M. Hanham) secured first prize with an Ancona (226 eggs, all first-grade).

In the class for Australorps, Mr. C. E. Graham won first prize, and was also awarded a first prize Burnley Champion Sash for a bird that laid 301 first-grade eggs, the highest score in all classes of the competition. Mr. T. J. Crewther's bird gained him second prize with a total of 274 eggs, and a bird entered by Messrs. Sweeney Bros., first prize winners in this class in the last two competitions, followed closely for third place with a total of 269 eggs.

In the class for All Heavy Breeds other than Australorps and Rhode Island Reds, Mr. D. Granter won first prize with a White Wyandotte that laid 272 first-grade eggs. Second prize was secured by Mr. T. Hinton with a Light Sussex (238 eggs) and Mr. B. H. Leonard, Tasmania, winner in this class with a Light Sussex last year, obtained third prize with a Light Sussex (234 eggs).

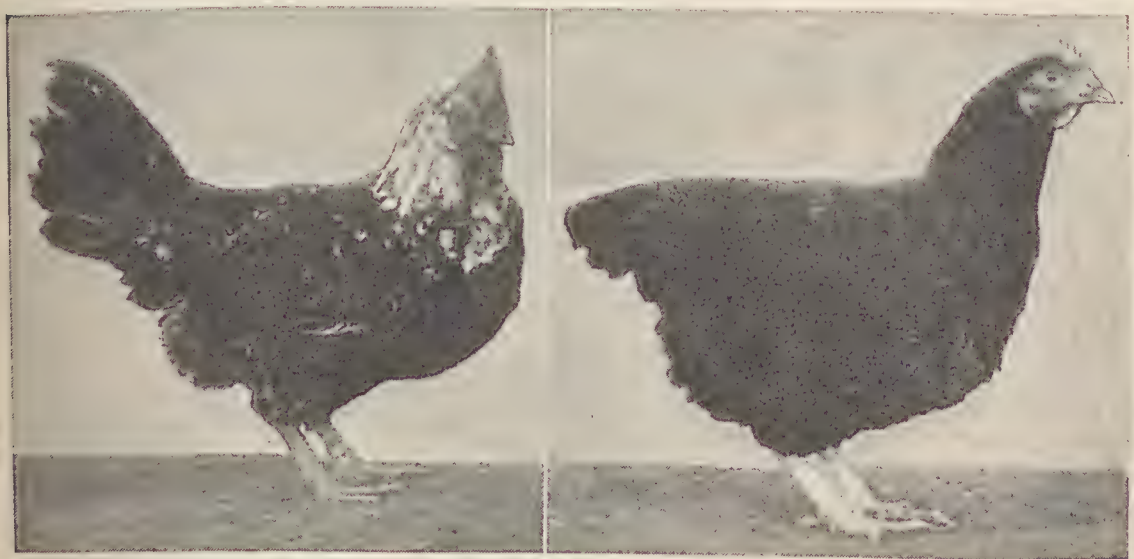
In the class for Rhode Island Reds, Mr. E. Ikin was awarded first prize. His bird laid a total of 242 first-grade eggs. Mr. G. Winter's bird obtained second prize with 225 eggs.

## *Cost of Feeding*

There were 236 fowls in the competition at its commencement, but thirteen died. The total number of days these latter birds collectively were in the pens was 2,716, which is equal to approximately eight birds having been there for the full 48 weeks. Therefore, the total number of birds in the competition for the whole period may be regarded as 231, and this is the figure used in working out the average, etc.

The different kinds and quantities of food fed to the birds during the currency of the competition were as follow:—

Wheat, 10,401 lb.; hulled oats, 3,033 lb.; cracked maize, 1,645 lb.; bran, 5,636 lb.; pollard, 9,323 lb.; meatmeal, 144 lb.; dried whey, 181 lb.; dried buttermilk, 50 lb.; meat, 231 lb.; onions, 78 lb.; shell-grit, 1,251 lb.; salt, 76 lb.



Left—Ancona, owned by N. Hanham, won first place in Class 3 of the competition with a score of 226 first-grade eggs. Right—Winner of Class 5, Rhode Island Reds. This bird, owned by E. Ikin, laid 242 first-grade eggs.

White Wyandotte, owned by D. Granter, won the heavy-breeds' section of the Competition with 272 first-grade eggs.

The total number of eggs laid, including those underweight, was 46,737, an average per bird of 202·3 for the 48 weeks.

The price realized for the eggs averaged a fraction over 1s. 9d. per dozen. The market value of the eggs averaged £1 8s. 8d. per bird, and the cost of food averaged 11s. 1½d. per bird, a fraction over 2½d. per week; thus the return over cost of food for 48 weeks averaged 17s. 6½d. per bird.

The prices received for the eggs, however, is exclusive of freight or commission charges, etc. Also it must be remembered that the eggs were laid by pullets in their first year of production, kept in single pens, the conditions being entirely different from those on commercial farms, where birds of various ages are kept in large flocks.

## *Retirement of Mr. J. T. Macauley*

A large gathering of his friends and representatives of the poultry industry attended a function at Burnley Horticultural Gardens on Saturday, 24th February, on the occasion of the retirement of Mr. J. T. Macauley. Mr. Macauley had been Curator-in-Charge of the Burnley Egg-laying Competitions for more than thirty years. Mr. D. Granter, Federal President of the National Utility Poultry Breeders' Association of Australia, presided.

From his early years and long before the Burnley Competition came into existence, Mr. Macauley has been keenly interested in poultry.

During his period of service at Burnley the Burnley Egg-laying Competition developed considerably. His helpful advice to competitors over the years is well known and helped many to ultimate success.

Mr. J. T. Macauley.

Among those at the gathering were the Hon. W. H. Everard, M.L.A., the Hon. J. Cain, M.L.A., members of the N.U.P.B.A. and other poultry organizations, representatives of the poultry press, numerous Burnley competitors and officers of Government Departments. Speakers referred in appreciative terms of the service rendered the poultry industry by Mr. Macauley.

In reply Mr. Macauley said that the many tasks he had had to perform during the course of his career at Burnley had been made lighter by the co-operation of competitors and the assistance of fellow workers.

## TABLE SHOWING MONTHLY LAYING RETURNS

| Month. | Light Breeds. | | | | | | Heavy Breeds. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | White Leghorns. | | | Other Light Breeds. | | | Australorps. | | | Other Heavy Breeds. | | |
| | Average No. of Birds. | Total. | Average. | Average No. of Birds. | Total. | Average. | Average No. of Birds. | Total. | Average. | Average No. of Birds. | Total. | Average. |
| April .. .. | 136 | 1,629 | 11·9 | 8 | 67 | 8·4 | 54 | 819 | 15·1 | 38 | 300 | 7·9 |
| May .. .. | 135 | 2,109 | 15·6 | 8 | 79 | 9·9 | 54 | 1,032 | 19·1 | 38 | 424 | 11·1 |
| June .. .. | 135 | 2,317 | 17·2 | 8 | 86 | 10·7 | 54 | 1,074 | 19·8 | 38 | 467 | 12·3 |
| July .. .. | 135 | 2,424 | 17·9 | 8 | 105 | 13·1 | 54 | 1,072 | 19·8 | 38 | 564 | 14·8 |
| August .. .. | 135 | 2,837 | 21·0 | 8 | 157 | 19·6 | 54 | 1,140 | 21·1 | 37 | 653 | 17·6 |
| September .. .. | 135 | 3,105 | 23·1 | 8 | 179 | 22·4 | 53 | 1,126 | 21·2 | 37 | 709 | 19·1 |
| October .. .. | 134 | 3,189 | 23·8 | 8 | 184 | 23·0 | 53 | 1,107 | 20·9 | 37 | 730 | 19·7 |
| November .. .. | 134 | 3,055 | 22·8 | 8 | 159 | 19·9 | 53 | 951 | 18·0 | 37 | 634 | 17·1 |
| December .. .. | 133 | 3,005 | 22·6 | 8 | 138 | 17·2 | 53 | 870 | 16·4 | 37 | 617 | 16·7 |
| January .. .. | 133 | 2,717 | 20·4 | 8 | 95 | 11·9 | 53 | 759 | 14·3 | 37 | 529 | 14·3 |
| February .. .. | 133 | 2,398 | 18·0 | 8 | 87 | 10·9 | 53 | 680 | 12·8 | 37 | 496 | 13·4 |

# Prize List—1944-45

## SINGLE TEST

### Class 1.—White Leghorns—Wet Mash.

FIRST PRIZE—CHAMPION CERTIFICATE, ALSO SECOND PRIZE—BURNLEY SASH.

| Pen No. | Name and Address. | Total Eggs. | Under-weight. | First Grade Eggs. |
|---|---|---|---|---|
| 148 | Mrs. K. C. McKenzie, 82 Clarence-street, Geelong West (Breeder:—K. C. McKenzie) | 290 | 3 | 287 |

SECOND PRIZE—GOVERNMENT CERTIFICATE.

| | | | | |
|---|---|---|---|---|
| 131 | L. J. Jackson, 241 Tooronga-road, Malvern, S.E.6 | 275 | 2 | 273 |

THIRD PRIZE—GOVERNMENT CERTIFICATE.

| | | | | |
|---|---|---|---|---|
| 145 | A. McIlvain, 24 Harbury-street, Reservoir, N.19 | 272 | .. | 272 |

### Class 2.—White Leghorns—Dry Mash.

FIRST PRIZE—CHAMPION CERTIFICATE, ALSO THIRD PRIZE—BURNLEY SASH.

| | | | | |
|---|---|---|---|---|
| 199 | Goulburn Valley Stud (J. E. Coupar), Box 18, Nathalia | 286 | 4 | 282 |

SECOND PRIZE—GOVERNMENT CERTIFICATE.

| | | | | |
|---|---|---|---|---|
| 228 | J. Robertson, Prince's-street, Ararat (Breeder:—Sweeney Bros.) | 273 | 1 | 272 |

THIRD PRIZE—GOVERNMENT CERTIFICATE.

| | | | | |
|---|---|---|---|---|
| 227 | J. Robertson, Prince's-street, Ararat (Breeder:—Sweeney Bros.) | 270 | .. | 270 |

### Class 3.—All Light Breeds, other than White Leghorns—Wet Mash.

FIRST PRIZE—CHAMPION CERTIFICATE.

| | | | | |
|---|---|---|---|---|
| 100 | The Nest Poultry Farm (M. Hanham), Five Ways P.O., via Cranbourne (Ancona) | 226 | .. | 226 |

### Class 4.—Australorps—Wet Mash.

FIRST PRIZE—CHAMPION CERTIFICATE, ALSO BURNLEY CHAMPION SASH.

| | | | | |
|---|---|---|---|---|
| 17 | C. E. Graham, Portarlington | 301 | .. | 301 |

SECOND PRIZE—GOVERNMENT CERTIFICATE.

| | | | | |
|---|---|---|---|---|
| 9 | T. J. Crowther, Carlow-street, East Bentleigh | 274 | .. | 274 |

THIRD PRIZE—GOVERNMENT CERTIFICATE.

| | | | | |
|---|---|---|---|---|
| 50 | Sweeney Bros., Rundle-street, Ararat | 269 | .. | 269 |

### Class 5.—All Heavy Breeds, other than Australorps and Rhode Island Reds—Wet Mash.

FIRST PRIZE—CHAMPION CERTIFICATE.

| | | | | |
|---|---|---|---|---|
| 57 | D. Granter, 163 Martin-street, Gardenvale (White Wyandotte) | 278 | 6 | 272 |

SECOND PRIZE—GOVERNMENT CERTIFICATE.

| | | | | |
|---|---|---|---|---|
| 59 | T. Hinton, 55 Lexton-road, Box Hill (Light Sussex) | 238 | .. | 238 |

THIRD PRIZE—GOVERNMENT CERTIFICATE.

| | | | | |
|---|---|---|---|---|
| 63 | B. H. Leonard, Bracknell, Tasmania (Light Sussex) | 234 | .. | 234 |

### Class 5.—Rhode Island Reds—Wet Mash.

FIRST PRIZE—CHAMPION CERTIFICATE.

| | | | | |
|---|---|---|---|---|
| 75 | E. Ikin, 44 Mackay-street, Seddon | 242 | .. | 242 |

SECOND PRIZE—GOVERNMENT CERTIFICATE.

| | | | | |
|---|---|---|---|---|
| 92 | G. Winter, "Denehurst," Murgheboluc | 225 | .. | 225 |

## FIRST CLASS CERTIFICATES OF MERIT TO HENS IN CLASSES 1, 2, AND 4 WHICH LAID 240 FIRST GRADE EGGS, AND IN CLASSES 3 AND 5, WHICH LAID 220 FIRST GRADE EGGS.

| Pen No. | Name and Address. | First Grade Eggs. |
|---|---|---|
| | **Class 1.—White Leghorns—Wet Mash.** | |
| 178 | T. Sweeney, Rundle-street, Ararat (Breeder :—Sweeney Bros.) | 270 |
| 158 | B. A. Milroy, 62 Baynes-street, Terang (Breeder :—F. Smith) | 262 |
| 140 | Lenham Poultry Farm (F. Smith), Terang | 261 |
| 147 | Mrs. K. C. McKenzie, 82 Clarence-street, Geelong West (Breeder :—K. C. McKenzie) | 260 |
| 157 | B. A. Milroy, 62 Baynes-street, Terang (Breeder :—F. Smith) | 260 |
| 120 | A. G. Fraser, Box 39, Horsham .. | 254 |
| 149 | J. F. McLean, Follett-road, Cheltenham | 254 |
| 184 | Wilma Poultry Farm (W. F. Jones), 35 Woornack-road, Carnegie | 252 |
| 128 | H. E. Hill, 20 Turner-street, North Wonthaggi | 251 |
| 129 | E. Ikin, 44 Mackay-street, Seddon .. | 251 |
| 160 | P. H. Peart, Rushworth .. .. | 250 |
| 127 | H. E. Hill, 20 Turner-street, North Wonthaggi | 249 |
| 146 | A. McIlvain, 24 Harbury-street, Reservoir, N.19 | 247 |
| 134 | D. M. Jenkins, 21 Speight-street, Newport, W.15 | 243 |
| 113 | A. R. Davey, Sellars-street, Greensborough | 242 |
| 139 | Lenham Poultry Farm (F. Smith), Terang | 242 |
| 143 | J. Lucas, Ballarat-road, Hamilton .. | 242 |
| 159 | P. H. Peart, Rushworth .. .. | 242 |
| 135 | C. and K. Langdon, Bullock Swamp, Colac | 241 |

| Pen No. | Name and Address. | First Grade Eggs. |
|---|---|---|
| | **Class 2.—White Leghorns—Dry Mash.** | |
| 212 | V. R. Milligan, State School No. 3426, Ultima | 267 |
| 211 | V. R. Milligan, State School No. 3426, Ultima | 259 |
| 208 | T. J. Kingston, Stonehaven P.O., via Geelong | 256 |
| 201 | L. J. Jackson, 241 Tooronga-road, Malvern, S.E.6 | 253 |
| 191 | F. A. Brennan, 97 Reeve-street, Salo .. | 252 |
| 207 | T. J. Kingston, Stonehaven P.O., via Geelong | 246 |
| 236 | A. Wilson, 17 Stewart-street, Wonthaggi | 246 |
| 190 | F. W. Becker, Follett-road, Cheltenham, S.22 | 242 |
| | **Class 4.—Australorps—Wet Mash.** | |
| 7 | H. and L. Clear, McEwan-road, Heidelberg West | 263 |
| 11 | A. R. Davey, Sellars-street, Greensborough | 260 |
| 12 | A. R. Davey, Sellars-street, Greensborough | 247 |
| 19 | T. Harding, Spring-street, Thomastown | 246 |
| | **Class 5.—All Heavy Breeds other than Australorps and Rhode Island Reds—Wet Mash.** | |
| 66 | Wilkinson Bros., Ben Nevis, via Ararat (Light Sussex) | 220 |

## STATEMENT SHOWING THE NUMBER OF EGGS LAID BY THE VARIOUS BREEDS IN THE COMPETITION, AND THE AVERAGE NUMBER OF EGGS LAID PER BIRD

| Breeds. | Number of Birds After Allowing for Deaths. | Eggs Laid. | | | Average Number of Eggs Laid per Bird. | | |
|---|---|---|---|---|---|---|---|
| | | First Grade. | Under-weight. | Total. | First Grade. | Under-weight. | Total. |
| LIGHT BREEDS—WET MASH— | | | | | | | |
| White Leghorns .. .. .. | 84 | 17,781 | 585 | 18,366 | 211·7 | 6·9 | 218·6 |
| OTHER LIGHT BREEDS—WET MASH .. .. | 8 | 1,231 | 105 | 1,336 | 153·9 | 13·1 | 167·0 |
| LIGHT BREEDS—DRY MASH .. .. .. | 49 | 9,786 | 176 | 9,962 | 199·7 | 3·6 | 203·3 |
| TOTAL LIGHT BREEDS—WET AND DRY MASH .. | 141 | 28,798 | 866 | 29,664 | 204·2 | 6·1 | 210·4 |
| HEAVY BREEDS—WET MASH— | | | | | | | |
| Australorps .. .. .. .. | 53 | 10,468 | 275 | 10,743 | 197·5 | 5·2 | 202·7 |
| Rhode Island Reds .. .. .. | 23 | 3,595 | 12 | 3,607 | 156·3 | ·5 | 156·8 |
| Other Breeds .. .. .. .. | 14 | 2,496 | 27 | 2,523 | 178·3 | 1·9 | 180·2 |
| TOTAL HEAVY BREEDS .. .. .. | 90 | 16,559 | 314 | 16,873 | 184·0 | 3·5 | 187·5 |
| TOTAL ALL BREEDS .. .. .. | 231 | 45,357 | 1,180 | 46,537 | 196·3 | 5·1 | 201·5 |

# IN THE ORCHARD

Compiled by G. W. GAYFORD, B.Agr.Sc., Horticultural Instructor

### *Are Your Fruit Trees too Old?*

THE necessity for adopting a long-range plan in regard to replanting orchards must be obvious to all fruitgrowers, but blocks of trees which, for some reason, are no longer economic propositions are still in evidence on many properties. There is an age for all fruit trees beyond which they no longer bear profitable crops of fruit. This age varies enormously and depends on the kind of fruit and the conditions under which trees are grown. The order of longevity usually is as follows, the first-named being the shortest lived:—peaches, apricots, citrus, cherries, apples, plums, pears, quinces. The conditions limiting the profitable age of fruit trees are one or a combination of the following in order of importance:—drainage, fungous diseases, insect pests, soil fertility and cultural practices.

A block of healthy young plum trees growing at Wandin.

Undoubtedly, a young block of fruit trees approaching maturity is a far more economical proposition than an ancient, diseased block. Old peaches and apricots become largely devoid of fruit-producing wood in their lower branches and gaps occur where trees have died through poor drainage. Old apple or pear trees with rough-barked trunks and branches are a harbour for codling moth, woolly aphis, red spider, and mealy bug. Fungous diseases such as *Armillaria* or *Polystictus* may be seriously affecting the health of a large number of trees. In such cases, the best treatment is to remove the trees and replant.

There are still numerous blocks of trees in orchards planted out with unwanted varieties or varieties which, due to some climatic condition, fail to bear regular crops. In these instances, the alternative to removing the trees is to rework them. The very short amount of time lost in production by frameworking trees is a distinct advantage where trees are still making vigorous growth and are free from pests and diseases. However, if the trees are past their peak of profitable production, they should be removed and replaced by young trees of commercial varieties.

Adopting a policy of regularly replanting an orchard will result in the property retaining its value. In addition, there is cause for pride in establishing a healthy block of young trees.

**Preparation of the Land.**—In removing old trees, it is important to extract as many of the roots as possible. The old trees should not be stacked up in a pile in a corner of the orchard, as they may serve as a source of infection for wood-rotting fungi. These old trees should be burnt as soon as possible.

Having removed the old trees, the rules of soil preparation for new ground would apply. It is advisable to rest the ground for a year or two, growing annual crops of peas, tomatoes, potatoes, &c., provided the care of these crops does not hamper other orchard operations. A good crop of tick beans, lupins or dun peas grown for green manure the year before planting is beneficial. If this cannot be done, an application of lime and farmyard manure should be made and ploughed under during the spring.

In irrigated districts such as the Goulburn Valley, the opportunity should be taken of regrading the land. It may also be a good time to alter the layout of irrigation ditches. In

some instances, one head ditch may have been used to supply water to widely different soil types, resulting in excessive watering of a light soil in order to provide sufficient water for a lower-lying heavier soil. The remedy is to provide separate head ditches for each soil type.

Orchards in hilly country frequently suffer from erosion in the centres of lands. Some attempt should be made to remedy this loss in future plantings by limiting the distance which water will flow with cross ditches or contour banks.

Thorough soil preparation is essential before planting young trees. Ploughing is necessary. If vegetables or a green crop have been grown during the summer, the final ploughing prior to planting should be done in the autumn. Where soils have become compacted, or a hard-pan layer has developed through irrigation and cultivation, subsoiling would be beneficial to break up this layer and allow deeper root penetration.

In rabbit-infested areas, considerable damage can be done to young trees by rabbits chewing bark and buds unless some protection is provided. It is preferable to rabbit-proof the whole orchard with wire-netting, but as this is in short supply, it may be necessary to tie hessian or some other material around the young tree. Some further notes on the setting out of an orchard block will be supplied in a subsequent issue of the *Journal*.

### *Harvesting Walnuts*

The harvesting period for walnuts can be recognized by the bursting of the green hulls, while a few nuts commence to fall to the ground. This process can be hastened by shaking the limbs with long poles. Prior to harvesting, the ground around the trees should be harrowed to facilitate picking up the nuts. Nuts should be gathered regularly, otherwise they will become stained. Before being placed in the sun to dry, the nuts should be washed to remove dust and mud. The drying may be carried out in the open, but the nuts should not be exposed to the sun for long periods or splitting of the shells will occur. To overcome this, trays should be stacked on top of each other in the afternoon. Best results are obtained by drying the nuts in a dehydrator in which the temperature and flow of warm air can be carefully controlled. If the nuts are stained they should be bleached prior to drying. A satisfactory bleaching solution may be made by dissolving 25 lb. of chloride of lime plus 18 lb. of washing soda in 50 gallons of water. After mixing this solution it should be allowed to settle and the clear liquid run off into another container. To the clear solution is added slowly 1 lb. of sulphuric acid. The nuts should be dipped for ten seconds in this solution, after which they are immediately dried.

### *Grafting Wood*

Growers who intend reworking fruit trees in the coming spring should select scions from trees producing fruit of first quality, true to type with regard to colour, &c., and free of pests or diseases likely to be transmitted. The chlorotic mottling of apples and pear leaf blister mite are two disorders likely to be carried in this way. At this time of the year, therefore, when such disorders are apparent, suitable trees should be marked with the object of obtaining scions during the pruning season.

# The Flower Garden

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley Gardens

ANNUAL and perennial plants which have finished flowering will need attention if the garden is to look tidy. Withered annuals should be pulled out and placed on the compost heap and the dead flowers on perennials can be cut off and also saved for compost. It is not advisable to cut back the perennials too soon after they have finished flowering. They are still maturing the underground stems and crowns and some of the plant food which has been made by the leaves will return to these perennial parts. A good plan is to delay cutting back until the tops show definite signs of yellowing.

An attractive spray of mixed wallflowers.

It is not too late to plant out spring flowering plants. Primula, stocks, nemesia, Iceland poppies, wallflowers, pansies and violas can still be planted.

### *Stocks*

Stocks are popular because of their long flowering season, their bright colours and their fragrance. Young plants, put in early this month, should be spaced about 15 to 18 inches apart. Before planting, the soil should be well limed, applying 4 to 6 ounces of ground agricultural lime per square yard. Wood ashes used at approximately the same rate are a good substitute, but the charcoal should be sieved out if the soil is already light. In heavy soil the charcoal may be broken up finer, and will be useful in loosening the texture.

The young stock plants will need protection from the cabbage white butterfly. A light dusting or spraying with arsenate of lead will check the ravages of the larvae of this insect. Use the spray at the rate of 1 ounce of arsenate of lead paste or ½ ounce of arsenate of lead powder per gallon of water. The dust may be purchased ready for application, or the arsenate of lead powder can be mixed with an equal quantity of lime and then dusted over the young plants through an old stocking.

Stocks like a fairly firm soil, and therefore, before planting, the soil should be made firm by tramping. Thereafter the surface can be stirred lightly to keep down weed growth, but deep cultivation should be avoided.

### *Lime*

In heavy soils where it is not intended to sow winter and spring flowering plants, it is advisable to dig the beds deeply and leave the surface as rough as possible. This will also apply to lighter soil types which, through constant watering or heavy applications of organic matter, have become rather sour. An application of lime or wood ashes at the rate suggested above should then be made to the surface and the soil left in this condition during the winter.

Frosts and heavy rain will cause the heavy soils to break down into a finer tilth and the lime will assist in this breaking down process. The deep digging together with the application of lime will sweeten the sour soils. It is a very good practice occasionally to give soils a spell during either the winter or the summer.

## THE VEGETABLE GARDEN

### Cabbages and Cauliflowers

*East Ham* cabbage plants can still be planted out this month, but it is advisable to plant them early because the growing conditions will become progressively less favourable as the weather becomes cooler.

A late planting of cauliflower can also be made now and the best variety for this time of the year is *Late Metropole*. The plants should be spaced 2 ft. 6 in. to 3 ft. apart and it is well to remember that good soil preparation is essential for this crop. The young plants should be kept growing from the time of planting out. They should not receive any check and it is best to grow them vigorously. To do this good soil preparation is necessary; dig in large amounts of organic manure such as well decayed stable manure and fowl manure.

### Lettuce

Plants of *Imperial D* and *Webb's Wonderful* can be planted this month, and for this crop as for cabbages and cauliflower, a rich soil is required.

After the plants become established occasional watering with nitrate of soda solution at the rate of 1 ounce in 1 gallon of water will be found beneficial. Care should be taken that the solution does not come in contact with the young leaves.

### Celery

Celery can be planted in trenches this month. This is a crop which home gardeners find difficulty in growing because their soils, as a general rule, are not rich enough. To be successful one must be liberal with organic manures and also it is well to supplement this form of manuring with applications of blood and bone or market garden manure, at the rate of 3 or 4 ounces to the square yard. Celery should be planted about 8 inches apart in rows which are about 3 feet apart.

### Onions

The early white-skinned varieties of onions such as *Silver Skin, Early Barletta* and *Australian White Queen,* may be planted out in early April. The rows should be spaced about 10 or 12 inches apart with 3 to 4 inches between the plants.

Cultivation should be shallow and constant, so as to destroy weeds while they are still small. The onion is a shallow rooting vegetable and weed growth competes with the crop for the plant food in the soil.

Seed of *Early Brown Globe* and *Odourless* can be sown now in seed beds, covering the seed to a depth of about ½ an inch.

### Leeks

Sow seed of *Mussleburgh* and *London Flag* this month in seed beds, covering it to about the same depth as the onion seed.

When sowing onion and leek seed, use a fine sandy loam for covering the seed, and preferably one free from weed seeds. Weeding onion seed beds is a tedious operation and disturbs the young onion seedlings.

### Carrots

Carrots which have matured may be allowed to remain in the soil, provided it is well drained. If aphis infect the tops, dust with nicotine dust, or spray with nicotine sulphate spray, at a strength of 1 dessertspoonful to the gallon of water plus a small amount of soft soap to increase the wetting properties of the spray.

# "DAMPING OFF" DISEASE OF FLAX

By C. R. MILLIKAN, M.Agr.Sc., Plant Pathologist, Biological Branch

"DAMPING off" is a seedling disease of flax which has been observed in all the principal flax-growing districts of Victoria. The soils in these districts are mainly acid, their reactions varying from approximately pH 5.0 upwards.

While a few instances have occurred in which the disease has caused very unsatisfactory brairds of flax, its effect has usually been of relatively minor importance. As indicated below, this freedom from serious damage in the past may have been due in some instances to the fact that the flax seed was treated with fungicidal dusts before use.

"Damping off" disease is favoured by any factor which tends to delay the rapid germination and emergence of the seed. Very cold weather, deep sowing, and excessive soil moisture are three such factors. The formation of a hard crust on the surface of the ground in very dry weather, also delays germination and aggravates the disease. The vigour of individual lots of seed has sometimes appeared to be a factor affecting the incidence of "damping off," while some crop failures due to the disease have occurred in cases where pasture has been ploughed up and sown immediately with flax.

### *Symptoms*

The disease is characterized by the occurrence of reddish-tan discolourations of the cotyledons, hypocotyls or radicles of affected seedlings (Figs. 1 and 2). In severe cases the seedlings rot completely before they emerge from the ground with a consequent reduction in the density of the stand.

Fig. 1—"Damping off" disease of flax. Reddish-tan discolourations occur on the young roots and cotyledons.

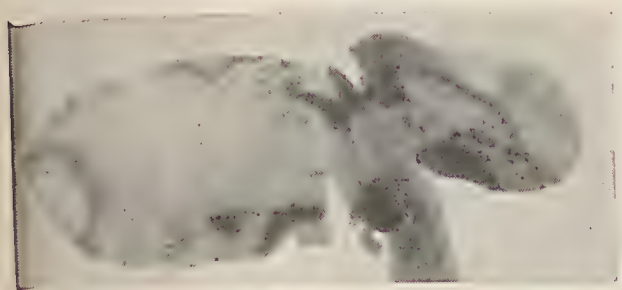


Fig. 2—Enlarged view of infected flax seedling showing reddish-tan discolourations on the cotyledons.

Less severely affected seedlings emerge, but they show the reddish-tan discolourations. Usually the cotyledons on such plants are not completely destroyed and the first true leaves are healthy. Lesions on the radicles vary from a small spot on one side which has no observable effect on the growth of the plant, to large lesions encircling and often involving the whole tip of the root. In the latter case the early growth of the plant becomes very stunted. Meanwhile the plant produces secondary roots, from above the rotted portion of the radicle (Fig. 3), and by means of these often recovers to a large degree from its initial setback.

### *Causal Organism*

Numerous isolations were made from lesions on plants obtained from various flax-growing districts in Victoria. The only fungus which was consistently isolated from all samples was *Pythium* sp.

Fig. 3—Production of secondary roots by flax seedlings following the rotting of the tips of the radicles.

Oospores of this fungus were readily detected in sections of diseased roots and cotyledons (Fig. 5). They measured from 13.8 to 15.2$\mu$ in diameter. *Pythium* sp. is a soil inhabiting fungus and is not normally carried on the seed.

A similar disease of flax, from which a species of *Pythium* (*P. debaryanum* group) was obtained in a high percentage of the isolations made from seedlings, has been described by Schlick (1942). In Saskatchewan, Vanterpool (1935) had previously reported that in moist localities, *P. debaryanum* played a contributory part with *Rhizoctonia solani* in the occurrence of "damping off" of flax.

### *Effect of Lime*

Soon after the germination of the "wither-top" experiments with various dressings of lime at Burnley during 1943 (Millikan, 1944), it was observed that the lime treatments had had an appreciable effect on the incidence of "damping off" lesions, caused by *Pythium* sp., on the cotyledons and hypocotyls of the emerged seedlings. The lime had been applied to these pots twelve months previously. The percentages of diseased plants in each treatment were therefore obtained, the results being shown in Table 1. It is emphasized that these figures do not include any pre-emergence mortality due to "damping off" which certainly occurred, nor do they make allowance for the severity of the symptoms in individual plants. This was roughly of the same order as the percentage of infected plants.

It is seen that applications of lime caused very significant decreases in the percentages of emerged plants showing symptoms on the aerial parts. It is not known whether this was due to the increase in pH resulting from the lime treatment, the improved physical condition of the limed soils, or to some other cause.

This result is similar to that obtained by Buchholtz (1935) in Iowa, where it was found that flax may be affected by a *Pythium* disease on acid soils. A reduction in the disease was found to result from steaming, formaldehyde treatment, or liberal applications of limestone.

Table 1.—Effects of Lime on the Incidence of "Damping Off" Lesions on Cotyledons and Hypocotyls of Emerged Flax Seedlings Growing in Gnarpurt and Digger's Rest Soils Respectively in Pots.

| Treatment per Acre. | Gnarpurt Soil. | | Digger's Rest Soil. | |
|---|---|---|---|---|
| | pH. | "Damping Off." | pH. | "Damping Off." |
| | | % | | % |
| Super. 1 cwt. .. | 6.0 | 46.5 | 7.1 | 34.7 |
| Super. 1 cwt. + slaked lime 1 ton | 7.1 | 22.0 | 7.6 | 12.0 |
| Super. 1 cwt. + slaked lime 2 tons | 7.6 | 12.0 | 7.9 | 14.7 |
| Super. 1 cwt. + slaked lime 4 tons | 7.9 | 10.5 | 8.2 | 12.3 |
| Difference for significance at 1 per cent. level .. .. | .. | 7.0 | .. | 5.1 |

Fig. 4—Section of a diseased cotyledon showing lesions.

### *Seed Treatment Experiment*

Recent work on the seed treatment of flax has indicated that soil borne fungi may be of considerably greater importance than seed-borne moulds in causing poor stands of flax. This is particularly true where a high percentage of cracked or broken seed occurs in the sample (Machacek and Brown 1942, Moore and Christensen 1943, Schuster 1943, Flor 1943). Soil moulds unable to attack undamaged seed, may cause considerable damage to cracked seed, unless these are protected by the application of a fungicidal dust.

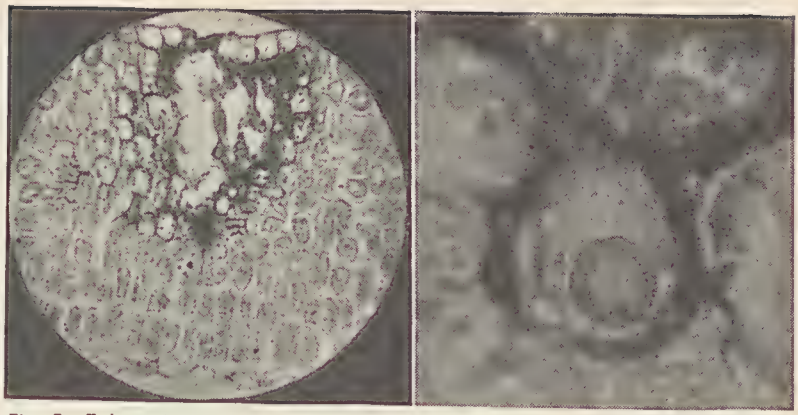


Fig. 5—Enlarged views of lesions in infected cotyledons, showing oospores of *Pythium* sp. in the diseased tissue.

In July, 1944, an inspection was made of a crop in the Lismore district which had been sown half with seed treated with a fungicidal dust, and the remainder with untreated seed. The treated seed had germinated well, while the germination of the untreated seed was uniformly bad, and the surviving plants showed severe damage from *Pythium* sp Arrangements were therefore made to conduct a seed treatment test on portion of the area on which the crop had failed. The soil concerned was a red-brown loam to sandy loam with buckshot, and gave a reaction of p.H. 5.1.

**Method.**—A sample of seed used to sow the original untreated crop on the area was used for the experiment. This was tested by the Ulster method (Muskett and Malone 1941) and found to be free of seed borne parasites. Microscopic examinations of the sample, however, revealed that a large proportion of the seed showed minute cracks in the seed coat. Broken grains also occurred in the sample. These later were removed from the sample used to sow the experiment.

The fungicidal dust treatments included in the experiment are shown in Table 2. These were applied immediately prior to sowing. Each plot consisted of a single row 7 feet long in which a known number of seeds (615) was sown at a uniform depth. Each treatment was replicated eight times in randomized blocks. Four of these blocks were treated with lime 2 tons per acre immediately before sowing, and the remainder were untreated.

As soon as the germination of the rows was complete, the number of plants which had emerged in each row was counted and the percentage emergence, based on the number of seeds sown, was calculated.

**Results.**—Very dry conditions were experienced between sowing and emergence of this experiment. This caused a hard crust to form on the surface of the ground, which in turn delayed emergence and favoured the occurrence of "damping off." In spite of this, considerable differences occurred between treatments as is shown in Table 2. Examinations of seedlings which failed to emerge revealed the presence of abundant reddish-tan lesions. associated with which was the fungus *Pythium* sp.

TABLE 2.—EFFECTS OF FLAX SEED TREATMENT ON THE PERCENTAGE EMERGENCE OF SEEDLINGS IN A FIELD TEST AT LISMORE.

| Treatment per Bushel: | Emergence. |
|---|---|
| | % |
| Untreated .. .. .. .. | 19.1 |
| Spergon, 4 oz. .. .. .. | 30.2 |
| New Improved Semesan Jr., 4 oz. .. | 34.6 |
| Nomersan, 8 oz. .. .. .. | 34.4 |
| Ceresan, 4 oz. .. .. .. | 25.2 |
| New Improved Ceresan, 4 oz. .. | 39.4 |
| Agrosan, 4 oz. .. .. .. | 27.5 |
| Agrosan, 8 oz. .. .. .. | 30.3 |
| Difference for significance at 1 per cent. level .. .. .. .. | 2.92 |

Highly significant increases in plant establishment (and therefore decreases in pre-emergence "damping off") resulted from

Fig. 6—Showing the extreme swelling of the radicles of germinating flax seed which was treated with New Improved Ceresan and then stored for four weeks. Normal seeding on left.

all treatments when compared with the untreated controls. In this regard, however, New Improved Ceresan (5 per cent. ethyl mercuric phosphate) proved superior to any other treatment, while Ceresan, Spergon, and Agrosan were the least effective of the dusts. Flor (1943) has also found that treatment of flax seed, showing mechanical injury, with New Improved Ceresan, resulted in improved germination.

The results of the lime test were as set out hereunder:—

| Treatment. | Emergence. |
|---|---|
| | % |
| Lime, 2 tons per acre .. .. | 31.5 |
| No Lime .. .. .. .. | 28.6 |

This difference was not significant.

Under the conditions of this experiment, therefore, the application of lime 2 tons per acre immediately prior to sowing the seed, had no effect on the incidence of pre-emergence "damping off" of flax seedlings.

One month after treatment, samples from the residues of the treated seed used to sow the tests were submitted to the departmental Seeds Analyst for germination tests to determine whether treatment with the various dusts and subsequent storage had had any effects on the germination capacity of the seed. The results of this test are set out in Table 3. The germination counts were made after four days, and seeds giving rise to abnormal seedlings were recorded separately.

The most striking features of this test were the very marked reduction in the percentage of normal seedlings recorded for the New Improved Ceresan treated sample, and the extremely swollen appearance of the radicles of the abnormal seedlings (Fig. 6). During the four weeks' storage the treated seed was kept in air-tight containers, which would possibly have aggravated the deleterious effects of New Improved Ceresan.

It is obvious, however, that flax seed treated with New Improved Ceresan should be sown as soon after treatment as possible, to prevent the development of the harmful effects resulting from the storage of such seed. Forsyth and Schuster (1943) have described an abnormality in flax seedlings resulting from treatment with Spergon 2 oz./bush. This consisted of a distortion of the fifth to tenth leaves above the cotyledons.

TABLE 3.—RESULT OF GERMINATION TEST WITH FLAX SEED TREATED WITH VARIOUS FUNGICIDAL DUSTS FOUR WEEKS PREVIOUSLY.

| Treatment per Bushel. | Germination After Four Days. | | Remarks. |
|---|---|---|---|
| | Normal Seedlings. | Abnormal Seedlings. | |
| | % | % | |
| Untreated .. | 89 | 4 | |
| Spergon, 4 oz. | 88 | 7 | |
| New Improved Semesan Jr., 4 oz. | 83 | 11 | Swollen radicles |
| Nomersan, 8 oz. | 85 | 7 | Few swollen radicles |
| Ceresan, 4 oz. | 90 | 4 | |
| New Improved Ceresan, 4 oz. | 52 | 29 | Radicles swollen—very extreme to almost normal |
| Agrosan, 4 oz. | 89 | 4 | |
| Agrosan, 8 oz. | 85 | 7 | Few swollen radicles |


ACKNOWLEDGMENT.

The writer gratefully acknowledges the valuable assistance given by Dr. I. F. Phipps of the Flax Production Committee of the Department of Supply and Shipping, in the conduct of the seed treatment experiment described in this paper.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# Red Cross Can Use It

DO you ever have a real turn-out of those miscellaneous drawers, cupboards, or the old tool-shed where every one tosses everything and conveniently forgets it? We aren't suggesting that you should, of course, but if you do (and there comes a time in the affairs of all families when this job just cries out to be done) and you come across the most amazing assortment of odds and ends, and can't quite decide what possible use they could be put to, here is a suggestion. Many of these are the things Red Cross can find a use for—a much better use than any one else could. So, what about pinning up this list, and when you do find something you don't want, well, just check it up on the list.

Possibly this sounds like an inventory for a junk-shop, but you would be surprised to find what value these articles have for Red Cross. For instance: gramophone records, gramophone needles, milk bottle tops, old electric light bulbs, bakelite bottle-tops, bottles (Waste Products Depot); interesting books or magazines (Book and Magazine Section); clothing (Civilian Relief Depot); string (Junior Red Cross); herbs, sun glasses, stamps, gardening tools, cotton reels, watches or watch parts, packs of playing cards and cross-word puzzles cut out from papers or magazines (Red Cross House).

Perhaps you wonder just what Red Cross does with some of these unusual oddments. The cross-word puzzles for instance are pasted on cardboard, the puzzle one side, the solution the other, and a pencil attached. They go to men in hospital. The watches and watch parts are for a soldier in convalescent home who is learning watch making and repairing watches. The cotton reels are used in occupational therapy for toy-making, and also for making small looms for men in bed to learn the first stages of weaving. These are just some of the unexpected uses to which Red Cross puts apparently useless articles. So remember, next time you're clearing up, please check up on this list. Send any of these things to Red Cross House, 289 Swanston-street, Melbourne, C.1., but to simplify distribution include in the address the department mentioned in the list. Parcels clearly addressed to Red Cross will be carried freight free on the Victorian Railways.

[Australian Red Cross Society.]

# HINTS FOR THE HOUSEWIFE

By RUTH BROMFIELD, Fruit Preserving Expert

### *Fruit Preserving—Some Faults and Their Remedies*

MANY housewives who ventured for the first time this season to preserve fruit by bottling may be wondering why their results were not perfect. Some of the more common faults and problems are discussed in this article and the explanations which follow should help to overcome these difficulties in future seasons.

#### Why Fruits Float in the Jar.

Housewives are often at a loss to explain why fruits float in the jar, and the following notes may help them better to understand how this may happen, and to avoid the trouble in future.

*Character of the Fruit.*—Some fruits are soft, tender or juicy. When heated their internal structure breaks down, the fruits collapse and, as a result, tend to float towards the top of the jar. Examples are strawberries and soft juicy plums.

*Improper Packing.*—If jars are not properly packed, that is, if not enough fruit is packed into the jars, the fruit will always tend to float in the syrup.

*Over-processing.*—Fruits that are much over-processed become soft and float for the same reasons as given under *Character of the Fruit.*

*Syrup too Heavy.*—If the syrup is too heavy it will cause a shrivelling of the fruit. The syrup should be adapted to the acidity of the fruit and one heavier than equal quantities of sugar and water will rarely be required.

#### Lack of Liquid in the Jars.

*Improper Packing.*—If the materials are packed too tightly in the neck of the jar, the gases and steam do not escape readily and when the pressure becomes sufficient to force an opening, a portion of the syrup is carried out with the escaping gases and steam.

*Air Pockets left in the Jar.*—When the syrup is poured over the fruit, large pockets of air are likely to be imprisoned among the pieces of fruit. This air escapes during processing and the liquid level falls as these spaces become filled with liquid. This difficulty may be overcome by agitating the jar after pouring in the liquid or by running the blade of a knife down the side of the jar to allow the air to escape.

*Jar too Tightly Sealed.*—The jars should only be partially sealed during processing as pressure is necessary to raise the lid sufficiently to allow for escape of gases; but if considerable pressure is necessary to lift the lid, the liquid may be carried out as well.

When the period of processing has been completed, the cover of the sterilizer should be removed *before* removing the fire or source of heat from under the sterilizer.

#### Spoiling of Bottled Fruits.

*Imperfect Containers.*—There are many ways in which a container may be imperfect. But if the jar is not air-tight after processing because of cracks, imperfectly fitting covers, perished rubber rings, &c., the fruit is sure to spoil. Any jars or rings showing these faults should be discarded before using.

Twenty-four hours after processing, the jars should be tested to see if they have been properly sealed. The clips or screw-top lids should be loosened and the jar lifted by the sealing lid, which, if sealing has been effective, will stay in position. If through some fault, the jar has not been sealed, the fault should be rectified by repacking the fruit in another container and reprocessing for fifteen minutes after the water in the sterilizer reaches boiling point.

*Poor Sealing Medium.*—Owing to wartime conditions, some difficulty has been experienced by manufacturers in supplying a reliable seal for fruit bottling jars with screw-top lids. This difficulty has now been remedied by the supply of rubber rings. If rubber rings show cracks or are pierced, they should be discarded. Jars must be made completely air-tight if the fruit is to keep.

It is usually unnecessary to pierce the rubber when removing the lid. The lid is removed by breaking the vacuum within the jar and to do this, a blunt instrument such as a butter knife should be used as a lever around the rim of the lid, thus allowing air to enter. The lid will then lift off easily.

*Over-packed Jars.*—All processing periods are based on moderately packed containers. If those foods which tend to form a tight pack with little or no free liquid present are over-packed, the normal processing period is not sufficient to preserve them.

*Under-processing.*—There are many ways in which the home preserver may under-process and still feel sure that the proper time has been given; for example, beginning to count the time too soon, temperature below proper level for part of the period, or slightly over-packing.

*Storage.*—Bottled fruit should be stored in a cool place. Warm storage hastens deterioration and spoilage.

Spoilage may either be due to moulds or fermentation. The mould (a white or green growth) usually forms only on the surface of the fruit or liquid and, if detected early, the fruit not affected may be boiled and used.

Fermentation causes the liquid to become cloudy and usually there is a froth detected at the top of the jar. Although not dangerous, usually the flavour of the fruit has deteriorated too much for it to be palatable.

### Discolouring of Fruit.

Sometimes the fruit in the top of the jar turns brown or black after the jar has stood for some time. This is due to certain substances in the fruit and indicates under-processing. Either the processing period was not long enough to exhaust the air properly or the temperature of the fruit was not sufficiently high to render these substances inactive. The trouble is most likely to occur with large fruits such as plums, pears and peaches. The remedy is an increase of five to ten minutes in the processing period.

## *Directions for Salting Beans*

With a home grown crop of French beans, there is usually a surplus beyond the family's daily requirements.

A simple method of ensuring a supply for the winter months is to put them down in salt. The equipment is simple. An ideal container is a large stone jar or crock, but any large wide-mouthed jar will serve the purpose. Scald the container thoroughly before using. When a clear glass jar is used, it should be wrapped in paper and stored in a dark cool place, as light causes loss of colour.

Only young, freshly-picked beans should be used. The beans should not be washed, but if dusty, thoroughly wiped. Top, tail and slice as for immediate use. Allow 4 to 6 oz. salt to each pound of prepared beans. Cover the bottom of the jar with salt, then add a layer of prepared beans to a depth of one inch. Add sufficient salt to cover the layer of beans. Continue in this order. Finally, cover the top layer of beans with a generous layer of salt. Press the beans down firmly before each addition of salt. Some moisture may be absorbed by the salt from the beans and the air, thus forming a very strong brine solution, but this is not detrimental.

Cover the top of the jar with a lid or plate or even paper secured with string or a rubber band. The jar need not be airtight, but should be protected from dust and a cover will prevent undue absorption of moisture by the salt. The salt must not be in contact with metal so a metal lid is impracticable if the jar is filled to capacity.

Beans can be added from time to time, provided the correct proportion of salt is added. To use the beans, they should be thoroughly rinsed in a colander under the tap, put into cold water and brought to the boil. This water is discarded and the beans are cooked until tender in fresh boiling water.

## *Some Useful Recipes*

Here are some useful and unusual recipes which have been tried and tested and can be commended to the housewife.

### Preserving Passionfruit Pulp.

Passionfruit adds a delightful flavour to many sweets, but the season of supply is all too short. If the garden includes a passionfruit vine, the pulp may be preserved very simply. The fresh flavour of the fruit is retained by this method.

Any small screw-top jars or bottles with corks will do. The pulp is removed from the shells and the jars are filled to the top. The lid or cork is placed on but not tightly. The filled jars are then placed in a deep saucepan and cold water is added to three parts up the sides of the jars. The lid of the pan is put on and the water brought to simmering point. The temperature should be maintained at this level for 30 minutes. The jars are then removed, the lids tightened and then inverted in melted wax to prevent air from penetrating.

### Passionfruit Skin Jam.

A most attractive deep-red, pleasantly-flavoured jam can be made, utilizing the skins of passionfruit.

The skins of twelve passionfruit make one pint of jam. Place the skins in a saucepan and cover with water. Grapes will improve the flavour; even the addition of 1 lb. is sufficient. The juice of two lemons is added also. Boil until the insides of the shells puff up and become soft enough to be easily removed with a spoon (about 30 minutes). Drain the water carefully from the fruit, add the insides of the shells. Allow one cup of sugar to each cup of the lining pulp. Boil rapidly until the syrup jells when tested (about 20 minutes).

### Quince Honey.

Quince honey is a delicious jam and is very quickly made.

5 lb. quinces, 5 lb. sugar, 1 qt. water.

Boil the peels and cores in water till cooked, then strain and add the grated quinces to the strained liquid; simmer ten minutes, then add the sugar, and when dissolved, boil till a good consistency (15 to 20 minutes).

### Melon and Passionfruit Jam.

3 lb. melon, 2 dozen passionfruit, 3½ lb. sugar, 2 lemons.

Peel, seed and cut melon into small blocks and sprinkle with 1 lb. of sugar overnight. Simmer till nearly cooked (about ¾ hour), then add the pulp of the passionfruit, the juice of the lemons and the remainder of the sugar. Boil till it will respond to the setting test (i.e. flake off the edge of a wooden spoon)—about 35 minutes.

# *Certified Pullorum Tested Flocks*

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942, issue of the *Journal of Agriculture*.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

| Owner. | Number of Birds. |
|---|---|
| Abernethy, F. J., Box 108, Horsham | 564 |
| Bray, J., 18 Hotham-street, Warrnambool | 98 |
| Christie, R. R., and Son, Bentleigh | 829 |
| Messrs. Corbett Bros., Torbay-street, Macleod | 1,317 |
| Davidson, Mrs. A., Sherbrooke-avenue, Ringwood | 107 |
| Greenshields, E. J., Lancefield | 669 |
| Hall, R. H., Wal Wal | 840 |
| Hemphill, A. E., "Glenara" Poultry Farm, Monegetta | 504 |
| Iredale, W. H., 197 Point Nepean-road, Seaford | 37 |
| Lawrie, Mrs. M. J., 107 Albert-street, Sebastopol, Ballarat | 430 |
| Orange, Mrs. C., "Lakewood", Marong | 234 |
| Ralph, W. R., Commercial-road, Lower Ferntree Gully | 107 |
| Ridgway, Geo., Callander-road, Noble Park | 196 |
| Salmond, J. B., Deer Park | 153 |
| Shelford, D., Beaufort-road, Croydon | 141 |
| Waldmann, F., Greythorne-road, North Balwyn | 936 |
| Wohlers, S., Box 17, Jung | 314 |
| Wooster, G., Yallambie-road, Watsonia | 46 |
| Yates, W., 64 Banks-street east, Ascot Vale | 30 |

# Tubercle-free Herds

ACCREDITED TUBERCLE-FREE HERDS.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

| Name. | Address. | Number in Herd. | Name. | Address. | Number in Herd |
|---|---|---|---|---|---|
| Aboriginal Station | Lake Tyers | 109 | Maloney, P. J. | Tongala | 66 |
| Armstrong and Son | Wangaratta | 105 | Murray, M. G. | Lima | 26 |
| Ballarat Orphanage | Ballarat | 129 | McNabb and Son, G. A. | Irrewillipe East | 154 |
| Banyule Stud Pty. Ltd. | Wangaratta | 54 | Nancarrow Bros. | Kerang | 47 |
| Beggs, A. R. | Beaufort | 70 | Noonan, G. | Benalla | 31 |
| Black, I. S., Estate | Mount Noorat | 53 | Noonan, Mrs. S. A. | Benalla | 35 |
| Clark, W. J. | Monomeith | 130 | Northcote Children's Farm | Bacchus Marsh | 165 |
| Cribbes, T. | Wangaratta | 39 | Onley, W. H | "Glenholme," Caldermeade | 67 |
| Deering, J. T. | South Wangaratta | 61 | | Tallarook | 67 |
| Dennis, Mrs. A. A. | Frankston | 23 | Parker, Mrs. L. M. | "Yarra View," Lilydale | 66 |
| Dookie Agricultural College | Dookie | 85 | Payne, A. E. T. | "Woodburn," Kilmore | 44 |
| Geelong Grammar School | Corio | 78 | Payne, . E. N. | Caldermeade | 155 |
| Gorman, A. W. | "Cathcart," Alexandra | 57 | Poole, M. A., and D. | Yannathan | 79 |
| Griffin, G. W. | Gladysdale | 50 | Poole, M. A., and D. | "Carellen," Mansfield | 43 |
| Griffiths, J. G. | Benalla | 121 | Powell, T. S. | "Faldinghurst," Upper Beaconsfield | 53 |
| Howlett, Mrs. G., and Miss E. Samuel | Lang Lang | 55 | Richardson Bros., Messrs. | Cobram | 27 |
| Jakobi, L. W. | "Granada," Yannathan | 89 | Roe, Thomas H. P. | Burnley | 6 |
| Johnson, F. G. | Horsham | 11 | School of Horticulture | Rutherglen | 37 |
| Kane, F. E. | Warrnambool | 28 | State Experiment Farm | Werribee | 245 |
| Kilmany Park Farm Home for Boys | Sale | 105 | State Research Farm | Vermont | 32 |
| Lady Talbot Milk Supply Co. | Cranbourne | 489 | Stephens, Dr. F. | Officedale | 45 |
| Lawrence, P. H. | "Rainga," Tarrawarra | 83 | Vagg, T. R. | Caldermeade | 65 |
| Longerenong Agricultural College | Dooen | 48 | Wells, W. G. | Mornington | 19 |
| | | | Woodyer, P. A. | | |

In addition to the above-mentioned, the herds set out hereunder may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

| Name. | Address. | Number in Herd at Last Test. | Name. | Address. | Number in Herd at Last Test. |
|---|---|---|---|---|---|
| Abbey, S. G. | Mernda | 7 | Bellis, Mrs. A. | Fyansford | 15 |
| Alexander, Miss R. | Ballarat East | 1 | Benson, R. | South Morang | 40 |
| Anderson, A. R. | Craigieburn | 123 | Bertuch, A. W. | Harcourt North | 22 |
| Anderson, Mrs. N. J. | North Geelong | 18 | Best, W. H. | Yarragon | 35 |
| Andison, J. A. | Thomastown | 53 | Best and Carter | Yarragon | 98 |
| Andrew, J. H. | Whittlesea | 18 | Bickley Bros. | Wollert | 64 |
| Andrew, T. S. | Whittlesea | 91 | Bingley, R. P. | West Geelong | 31 |
| Andrew, W. | Whittlesea | 123 | Blackmore, P. J. | Ballarat North | 57 |
| Andrews, E. H. | Templestowe | 19 | Blake, Mrs. J. | Yarragon | 11 |
| Anglis, Mrs. R. | Ballarat | 1 | Blood, J. | Ballarat | 8 |
| Angus, W. | Moolap | 6 | Blythe, R. E. | Connewarre | 71 |
| Armstrong, Mrs. M. A. | Sebastopol | 15 | Boland, Mrs. A. | Yarragon | 31 |
| Artley, A. | Sebastopol | 11 | Boland, D. | Yarragon | 40 |
| Atkinson, A. | Cambrian Hill | 21 | Booth, Mrs. A. | Warrandyte | 7 |
| Atkinson, V. | Cambrian Hill | 26 | Bourke, C. G. D. | Upper Plenty | 51 |
| Attwood, F. A. | Eaglehawk | 18 | Bourke, G. J. | Fairfield | 82 |
| Baddon, D. W. | Yarragon | 74 | Bourke, J. W. | Somerton | 33 |
| Baglin, E. | Wallington | 41 | Bourke, W. J. | Alfredton | 26 |
| Bailey, Mrs. A. | Doreen | 11 | Bradbury, G. | Kangaroo Flat | 20 |
| Baker, A. | Bannockburn | 32 | Brady and Cunningham | Doncaster | 28 |
| Balharrie, J. A. | Whittlesea North | 68 | Bray, Mrs. O. C. | Glenroy | 34 |
| Banfield, J. G. | Rosanna | 66 | Brereton, E. | Kennington | 25 |
| Barclay, A. H. | Whittlesea | 93 | Brock, J. N. | Epping | 16 |
| Barker, Mrs. E. M. | Huntly | 11 | Browell, L. | Golden Square | 15 |
| Bates, D. S. | Whittlesea North | 22 | Brown, J. | Geelong West | 7 |
| Bates, J. | Connewarre | 21 | Brown, Mrs. A. | Malden Gully | 11 |
| Batten, R. J. | Wollert | 51 | Brown, R. | Kennington | 4 |
| Beck, J. P. | Ceres | 48 | Brownhill, C. E. H. | Bundoora | 32 |

| Name. | Address. | Number in Herd at Last Test. |
|---|---|---|
| Bryden, A. C. | Bendigo | 17 |
| Bumpstead, K. | Moolap | 10 |
| Bunting, J. | Epping | 30 |
| Burke, T. S. | Huntly | 19 |
| Burns, D. | Moolap | 8 |
| Butler, W. | Wallan | 69 |
| Cahill, J. M. | Warrandyte | 8 |
| Callaghan, Bros. | Thomastown | 66 |
| Callaghan, L. | Epping | 28 |
| Cameron Bros. | Belmont | 67 |
| Cameron, G. A. | Connewarre | 36 |
| Cameron, J. J. | Connewarre | 53 |
| Campbell, T. S. | Yarragon | 8 |
| Cardwell, E. F. | Whittlesea | 62 |
| Carroll, M. | Fyansford | 28 |
| Carr, G. | Leopold | 20 |
| Carr, W. J. | Wollert | 62 |
| Carter, R. H. | Fyansford | 23 |
| Catt, G. P. | Yarragon | 53 |
| Cavagna, Miss | Sedgwick | 7 |
| Chadwick, Mrs. E. G. | Doreen | 39 |
| Challis, L. J. | Connewarre | 57 |
| Chandler, K. J. | Doreen | 29 |
| Child, G. P. | Epping | 54 |
| Chiminello, A. | Epping | 35 |
| Christian Bros. | Doreen | 38 |
| Clark, H. M. | Nerrina | 18 |
| Clark, P. W. | Whittlesea | 58 |
| Clark, W. and T. | Kal Kallo | 68 |
| Clemence, S. | Warrenheip | 23 |
| Close, A. E. | Ballarat | 37 |
| Clunes, P. | Coburg | 42 |
| Cochrane, C. | Ballarat North | 31 |
| Cocks, J. J. | Marong | 17 |
| Collins, L. | Doreen | 54 |
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In addition to the above herds, there are 1,485 head of cattle on 271 properties supplying milk to Benalla, Wangaratta, Rutherglen, and Yea that have passed two successive negative tests.

There are also 317 herds in which 11,527 head of cattle have passed one test, and may be considered, therefore, to be in process of becoming tubercle-free herds.

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*Issued by direction of the Hon. N. A. Martin, M.L.A., Minister of Agriculture.*


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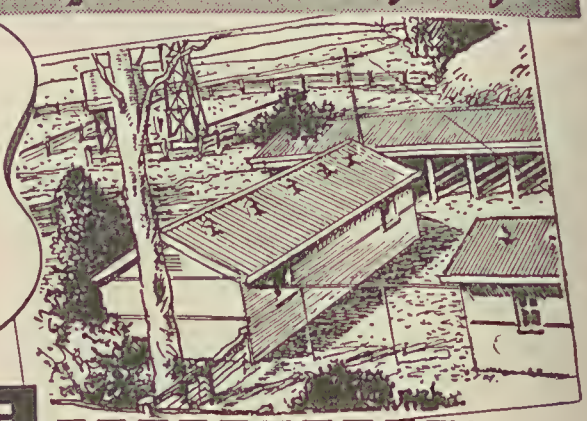

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# Wartime Agriculture in Victoria

An Address—

by Mr. H. A. MULLETT, B.Agr.Sc., Director of Agriculture, at the Annual Convention of the Chamber of Agriculture, held at Melbourne, 20th March, 1945

EACH year for many years I have addressed this Chamber on some aspect of the work of the Department of Agriculture. As the war has proceeded, the Department has become more and more engrossed in fostering the production of food in special directions and in assisting to solve the many complex problems arising out of the shortage of manpower and nearly every commodity required by the farmer. The greater portion of the Department's normal research and advisory functions, and many of its regulatory functions, had to be set aside for the time being or reduced to barest essentials as the officers were released for active service, or utilized for implementing the food programme, the rationing of superphosphate, and so on. More recently the severe drought in the north has imposed many additional duties, including the procuration of agistment for thousands of horses, the rationing of hay and chaff, and the regulation of the use of oats.

This preoccupation with urgent war duties, however, does not mean that the research and advisory functions are less important than they were; indeed, after the war, there is every indication that they will be called upon to make an even greater contribution to our agricultural progress than in the past.

On the last occasion I was privileged to communicate with members of the Chamber, it was through the 1943 *Year-Book*. Then I reviewed some of the current wartime agricultural problems and the administrative steps that had been taken to deal with them. A national wartime food policy by that time had clearly emerged, but the results could not be forecast with certainty. Now, after five years of war, it is possible to demonstrate the effects of the war on our agriculture and, after reviewing the objectives, assess the success or failure of the policies adopted, and also to see somewhat more clearly the nature of some of the postwar problems.

Despite the loss to the Armed Forces and to the munition factories of many of the most virile men and women in agricultural industry, and all the upset that is bound to occur when the consequential reshuffling process was going on; despite all the delays due to the restrictions imposed on transport; despite serious reductions in the supply of fertilizers, and in many cases inability to obtain farm requisites, machinery and repairs, and the general sense of frustration and often loss of confidence by the man on the land in his ability to undertake new projects, the crop and stock production figures during the war show that a very solid effort has been put up. However, any expansion has been confined to those industries placed on a relatively high priority, such as vegetables, potatoes, flax, sections of the dairy industry, and poultry. The meat-producing industries have held their own, but in cereals there has been a steady decline in the acreage sown, a marked reduction in the amount of cereal hay cut, and a diminution of reserves of fodder carried over from year to year. At present these are at a very low level. The reduction in production of cereals and the incidence of the application of priorities leading to reduced stocks of hay and grain has rendered us, in this State, more vulnerable to drought, and this at a time when transport of bulky produce, or indeed any produce, from those distant States which have small surpluses, is most difficult and protracted. In addition to the losses of crop and stock directly due to drought, there will be repercussions on other grain and fodder-consuming industries in districts not directly affected by drought. I refer, of course, to the dairying, pig, and poultry industries.

Broadly speaking, the general principles under which wartime agricultural production has been regulated are simple enough. The Commonwealth Government, which has assumed direction of the nation's war effort

under the National Security Regulations, has indicated from time to time what its requirements of primary produce are, introduced various legal controls to give the needs of the Armed Forces and munition factories priority, and called upon the States to assist it to meet the agricultural production goals which it laid down from time to time, and in some cases to administer the controls. These controls varied in accord with the expanding needs and special requirements of the Armed Forces, of our Allies, of the Mother Country, and of the civilian population. When it became apparent that supplies of labour and superphosphate, farm machinery, farm requisites such as fencing wire, water piping, building materials, fungicides, and so on, were not adequate to meet the needs of agriculture as a whole, various sections of it were given priority for their needs over other parts, but the best priority given any agricultural industry naturally was below that accorded the fighting forces and munition factories.

Early in the war the British Government made it clear that Britain could not supply shipping to carry luxury products like apples 13,000 miles overseas, and that as ample supplies of wheat existed much nearer in Canada than in Australia she could not ship much of our wheat. This led to large stocks of wheat accumulating in Australia, and had an important bearing on the wartime policy pursued regarding cereals. Later, although she wanted meat and butter urgently, the sinking of refrigerated ships compelled Britain to divert for the time being some of the ships intended for Australia to the Americas from the Atlantic coast, of which the route to Britain is much shorter than from Australia. The foods that Great Britain required most were butter, condensed and powdered milk, cheese, meat, eggs, dried fruits, and commodities such as flax. Similar foods were required by the armies based in Australia, and, in addition to flour and the usual Army foodstuffs, potatoes and vegetables which are especially valuable in the dietary and which can be dried or used fresh or canned. Accordingly, vegetables, vegetable seeds, and potatoes were placed in No. 1 agricultural priority, dairying in No. 2, meat rather lower down, and cereals at the bottom of the list. Notwithstanding all these steps, the exportable surplus of butter and meat, after the needs of our Forces, those of our Allies, and the civilian population had been met, proved insufficient to supply the urgent needs of the United Kingdom, so the Commonwealth Government found it necessary to ration butter and later meat, and to some extent, eggs.

The cultivation of row crops has been greatly facilitated by mechanization.

In Victoria the flour-milling industry, in addition to supplying the requirements of more than one and three-quarter million people, and normally exporting substantial quantities of flour, supplied large quantities of relatively cheap concentrates to the dairy, pig, and poultry industries. When the expansion of these three industries was urgently needed special efforts were made to secure substantial contracts from the British Government for the export of flour so that the offals would be available for use here.

These were successful and Victorian mills received their quota of an order for 500,000 tons. This enabled the supplies of bran and pollard to be increased, but their production did not keep pace with the increasing demand, and so the Commonwealth Government decided to sell wheat for stock feeding purposes at the relatively cheap price of 3s. 6¾d. a bushel delivered at consumers' sidings, and the consumption of wheat, both whole and crushed, rapidly expanded.

In wartime, when you place one agricultural industry on a high priority it means that you give it as far as practicable the right of way for labour and supplies, and this stimulates it. Conversely, an industry on low priority tends to decline.

In addition to stimulating an industry by means of a system of priorities, it can be stimulated by subsidy or by means of the price paid for the produce, e.g., potatoes were purchased on contract at £12 10s. a ton compared to fluctuating pre-war prices usually of less than half that figure. Both these methods were followed.

Let us examine what success this stimulation of particular industries has attained:—

The acreage planted to potatoes in Victoria showed a persistent decline each year for some years prior to the war, and in 1938-39 reached the low level of 34,000 acres. The decline continued during the first year of the war, but since 1942, when a substantial price incentive was first applied, there has been steady expansion, and last year 70,000 acres were planted in Victoria. Despite this expansion in Victoria and other States, the need for potatoes, including dried potatoes for military purposes, absorbed the whole of the produce, and, as you know, at times potatoes for civilians were virtually rationed. This year it is estimated that 86,000 acres of potatoes have been planted in Victoria. The yields are good, and a record crop is expected. In the meantime the anticipated military need has fallen away and a surplus will result. Had the average yields been as light as they were in some of the earlier war years, there may not have been a surplus. This shows the difficulty of planning production.

Since the war the canning programme for tomatoes was "stepped up," and the area normally planted in this State was increased by about 3,000 acres, i.e., more than doubled. In addition, the acreage of other vegetables such as carrots, cabbages, and so on, has been increased by from 6,000 to 8,000 acres.

Owing to the failure of overseas supplies the production of vegetable seeds became urgent. This was taken in hand, and the pre-war acreage of about 2,000 acres was raised to close on 11,000 acres for this year. This has rendered Victoria largely independent of imports and provided an export surplus.

Linen flax is used for the production of canvas hoses, tarpaulins, parachute webbing, and for sewing twine for military boots. Most of the supplies of this fibre or substitutes were formerly imported. Under the stimulus of war needs, a No. 1 priority and a price incentive, the acreage sown in Victoria to flax was lifted from 700 acres to nearly 40,000 acres last year.

In the dairying industry the demand for condensed and dried milk and for cheese has been at the expense of butter, the production of which has fallen sharply. In condensed milk the present production in Victoria is three times the pre-war figure. A study of the trends of production of dairy produce (all calculated as whole milk), enables one to say that while the average production of dairy produce during the five war years has exceeded that of the five years immediately prior to the war by nearly 8 per cent., the production trend is definitely and steadily downward each year as the war has progressed, and this despite stimulation by a relatively high priority for labour and supplies, and by various subsidies in the later years of the war.

The poultry industry has responded in a marked degree to wartime stimulation, which includes price increases and cheap wheat. In 1938-39 egg production amounted to 14,000,000 dozen. The average production for the war period ended 1943-44 was over 20,000,000 dozen. This year a total of 26,000,000 dozen is forecast.

Beef production has fallen from the first year of the war, but this has been compensated

Production of condensed milk in Victoria has risen to three times the pre-war figure.

for by increased production of mutton and lamb. The production of pigmeat has fluctuated widely, but during the last two years shows signs of some stability. These fluctuations were due to sudden changes in the export requirement by the British Government, but stability has been induced for the time being by better price incentive and in part by cheap wheat. The average total production of meat since the war is approximately equal to the production during the five years prior to the war—but in the live stock industries it is not sufficient to know the production, that is to say, the slaughtering; it is necessary to compare the numbers of stock on hand at the beginning and at the end of the period and to know something of their ages and condition. On the crude figures the number of cattle has been well maintained. The sheep population, which was at record numbers (over 20,000,000 head), showed a drop of about a million head in each of the last two years, due to the inability of the pastures to sustain them when affected by reduced supplies of superphosphate and lack of rain. This year the drought will cause heavy reduction in numbers, and is bound to affect the total production next year.

Wool production follows the sheep numbers, and there is an average increased production in the five war years ended 1943-44 of 32,000,000 lb. weight. The increased production no doubt reflects to some extent the stabilization of the market for wool under the contract with the British Government which ended, for the duration of the war and a year after, the uncertainty as to the outlook for price which operated immediately prewar. So far, so good.

However, parallel with this expansion of production in most of these industries, the acreage sown to wheat steadily declined from 2,800,000 acres in 1939-40 to 1,800,000 acres in 1944-45.

The barley acreage was unusually high during the first three years of the war, but it fell sharply to 83,000 acres in 1943-44.

Maize, of which there were 19,000 acres in 1930-40, fell to 6,500 acres in 1943-44; in the main this was due to competition from vegetables and vegetable seeds.

The acreage sown to oats declined, but not to the same relative extent.

Comparing the five years prior to the war with the five war years commencing 1939-40, the production of cereal hay showed a decline of 200,000 tons per annum, but this was partly offset by an increased production of grass hay averaging 120,000 tons per annum; the decline in production, however, was accompanied by a reduction in fodder reserves.

In this State we entered last year with diminishing fodder reserves. The season in the north during the latter part of 1944 was extremely dry, and we are now dependent

largely upon wheat and wheat by-products as our almost sole source of concentrated stock food.

When the drought developed nearly a million acres of oats failed, as well as the greater portion of the area sown to wheat, while the hay cut was reduced to one-third of normal. When it was clear that there would be wholesale crop failures and that the pastures over much of the north of the State would burn up, the rate of consumption of wheat increased to a remarkable extent. This was due, in part, to panic buying, but in the absence of oats, barley, and other fodder, there was necessarily dependence on whole and crushed wheat for stock feed. Under pressure of circumstances, limited rations of wheat were even fed to horses.

The drought had found the weak spot in the wartime agricultural economy of Australia, and the State, in order to attempt to maintain its essential industries dependent upon horse traction, and at the same time enable farmers in the drought-affected areas to sow their crops, has been compelled to invoke the aid of National Security Regulations to control the use of hay and chaff, and to ensure the use as seed of all oats. Despite this step and some importations from the small surpluses in Western Australia and South Australia, the supply of oats will be insufficient to seed large areas normally sown to that cereal, and many farmers will be compelled to sow considerable areas with wheat for hay instead of oats. There may be insufficient chaff to enable all the working horses to return to the north, and efforts are being made to see that every tractor available is worked to the maximum capacity.

It has been said that one of the principal factors in the reduction of the acreage sown to cereals is the reduction in the quantity of superphosphate made available to cereal growers in accordance with the low priority accorded those crops in the wartime national economy. From a psychological point of view this is perhaps true, but it must be remembered that superphosphate is applied to cereal crops for the purpose of producing more bushels per acre. That is to say, its use by farmers is purely a matter of economics. It is properly used to the extent to which the extra yield will pay for the superphosphate and leave a net profit to the farmer. It is an incentive to production because it increases the return to the farmer. *An extra price incentive for the product could have taken the place of the superphosphate incentive had it been considered in the interest of the national war effort.*

When the wartime production of Victoria is reviewed dispassionately it cannot be denied that the maximum overall production has been attained, having regard to the amount of labour, machinery and materials made available to the man on the land, and to the disturbing factors to which I have already alluded.

Potato production in Victoria has expanded greatly during the war years.

Normally there are over 100,000 men permanently employed full time in the industry, and 8,000 women also employed full time. This does not include women employed in domestic duties. By March, 1943, the number of men engaged had fallen by 16,000, but this drop had been offset by 8,000 additional women. In addition the deficiency in the number of tractors available for replacement over the five war years totalled 3,700. This meant carrying on with many tractors long past their normal period of use, and with consequent loss of efficiency. On the other hand in the dairying industry many more milking machines than usual were installed; there were additions to mechanical grasshay-making equipment, and there was a substantial degree of mechanization of vegetable farming and some of potato farming.

It is clear then that war conditions have brought about some very considerable modifications of our agriculture. Some industries have been artificially expanded, some have showed little change, and some have been contracted. In practically all of them there is much deferred maintenance work to be done and much worn-out machinery to be replaced, and of those things that will require urgent attention the elimination of the rabbit menace will not be the least.

So far as our export industries are concerned the demand for food in Europe for a few years should sustain the market for a period. In the case of industries like potatoes for which there is no export, the difficulties attendant in reducing production may be as great as those which occurred in its stimulation.

The policy of the British Government recently announced by her Prime Minister is to maintain her agricultural production at a higher level than prewar. This may mean in the end that she will buy less from us than in the past. The question of finding new markets is important; such markets are not likely to be high-priced markets; this means we must keep constantly in mind the necessity to reduce production costs by increased production efficiency.

The intensification of mechanization of some industries under war stimulus is one way of reducing costs, and *we must not neglect the aid of scientific research and investigation* for the same purpose. When the time comes for the officers to lay down their wartime duties, I can assure you they will take up their research and advisory functions with alacrity and vigor, and that they look forward to an era of successful co-operation with the man on the land.

# Wheat for Stock Feeding

MR. T. Adkins, State Superintendent of the Australian Wheat Board has announced that there will be further reductions in the monthly releases of wheat for stock feeding.

The quantity of wheat released for feeding dairy cattle, pigs, poultry and essential working horses during April was 8 per cent. below the quantity released in March, and it has been found necessary to make a further reduction of 2½ per cent. in the allocation for May.

As the number of users requiring wheat for feeding priority stock is increasing due to the shortage of other fodders, the reduction in the quantity of wheat available to individual buyers may be slightly greater than the 2½ per cent indicated above.

However, in view of the reduced running time of flour mills, as from 1st April, bran and pollard supplies have been reduced by 50 per cent., and it has been necessary to allocate a proportion of this wheat to flour millers, to replace, in part, this short production. This special allocation to millers will be distributed by them in the form of crushed wheat or meal to users of bran and pollard.

As a result of these adjustments, the quantity of wheat feed available, either as bran and pollard or whole or crushed wheat, will be 22½ per cent. less than the total available in March. Users should frame their feeding programme accordingly, as it is apparent there will need to be a reduction in herds and flocks, except where some substitute feed can be arranged by the user himself.

The May release is at a higher rate of release than can be maintained for the balance of the year, and further reductions will be necessary as the year progresses. Future reductions should, however, be small and it is hoped that the rate of supply can be kept fairly uniform throughout the winter months.

# Irrigated Pasture and Lucerne Competitions

## Murray Valley District, 1944-45

By L. C. BARTELS, B.Agr.Sc., Senior Agrostologist.

A corner of Mr. W. P. Smith's pasture.

THE Yarrawonga Weir was completed in 1939 but reticulation of the area to be irrigated is unfinished, being interrupted by war conditions. When the scheme is fully developed water will be supplied to an area of some 400,000 acres west of Yarrawonga and between the Murray River and the Broken Creek.

Before irrigation, wheat growing and sheep were the main farming pursuits in the district and the standards of agriculture and stock husbandry were high. There was some opposition to irrigation because seasons had been generally favourable and irrigation imposed new obligations, the necessity of new farming methods and more concentrated effort, but the experiences arising from the dry weather of the last few years have emphasized the value of irrigation in the district and the security and opportunities for increased production it gives.

The suitability of the Cobram district for intense culture has been demonstrated and there is little doubt that all the soil types as revealed by survey can be irrigated with advantage, but the lines of development are governed by the fact that water is allotted on what is called a one in four basis, which means that water rights are fixed at 1 acre foot of water for every four acres of land commanded by the water and classified as suitable for irrigation. This means that only partial irrigation is practicable—that mixed dry-farming and irrigated culture will go on together and the divided activities of the farmer will make intensive irrigation very difficult. When the area becomes fully developed it is likely that the water supply will be fully taxed.

The Murray Valley farmers are heirs to the experiences and knowledge of previous irrigators in Victoria—they have guidance from experienced engineers of the State Rivers and

A mixed pasture on a Yarrawonga irrigation farm.

Water Supply Commission, they have encouragement from the many outstanding successes in other districts and they have warnings too of the results of malpractices which have caused trouble in older districts. Efficient control of irrigation water is of prime importance and in recognition of that, grading and checkbanking are being done under guidance of the district engineers and with modern facilities represented by the graders in use, very good layouts are made. In most cases, too, the farmers pay attention to the advice that extended preparations are desirable to permit settling after preliminary grading and in most cases cropping with annual crops is adopted for a start. This season, under the drought conditions and in response to the appeal for sowing an increased area of annual summer fodders, a big area of millet and Sudan grass has been put in.

The State Rivers and Water Supply Commission, through the District Engineer, Mr. H. C. Kermode, undertook the surveying and directed the cultivation and sowing of nearly 1,000 acres of summer fodders. All this work was done in conformity with approved principles and besides being a contribution towards the relief of the fodder shortage, the work is a foundation for the sowing of permanent crops such as lucerne and pastures.

Growing annual summer fodder is likely to be part of the farmers' programmes in future years, but repeated cropping with such crops does not represent the best practice or one conducive to conservation of soil fertility which should be of greatest concern in an irrigation district.

There is evidence in plenty in older irrigation districts that irrigation can be an agency for land despoliation because of the soil exploitation it permits, but happily there is also evidence that irrigation is quite compatible with soil improvement and the maintenance and increase of soil fertility and that, too, in places with bad traditions, which are poor advertisements for irrigation.

Good irrigation does not involve very difficult or mysterious processes, but it does imply careful watering—to give adequate but not excess water—it means the growing of suitable crops, and leguminous crops particularly because they are fertility builders. Their culture requires fertilizer in liberal quantities and phosphate fertilizers are of paramount importance in that regard.

The utilization of the crops has a big influence on the development of an irrigation farm, and the grazing animal must be regarded as an important agent in fertility building because the droppings return much of the mineral matter ingested and much organic matter for humus making.

Irrigated pastures are a great stabilizing influence in irrigated agriculture and the oldest pastures and the most liberally top-dressed pastures are the best as measured by the conditions and productiveness of animals they carry.

### *The Prize Winning Pastures*

The prize winning exhibit was submitted by Mr. H. D. Johnson of Yarroweyah North, who entered an area of 14 acres of Wimmera rye grass and subterranean clover. The pasture had a dense growth with a good balance of grass and clover. It had some "strangers" of other annual clovers, but weeds were scarce; barley grass was showing in places.

Mr. Johnson's pasture was established in 1940 when the grass and clover were sown under cover of a wheat crop. Six pounds of Wimmera rye grass per acre with 4 lb. of subterranean clover per acre were put in. Superphosphate was applied at 60 lb. per acre.

In the first year the wheat was irrigated once. Every year since, the grass and clover have been topdressed with superphosphate at the

rate of half a bag per acre. The area has been heavily grazed but in 1944 grazing was not so hard and the paddock had been surface-cultivated with the "Sunprong" and this led to a regeneration of the Wimmera rye grass which was very prominent. In 1944 it was watered once in autumn and once in spring.

Mr. W. T. Buzza submitted an area of 60 acres of pasture, half of which had been sown in 1941 and half in 1942. Previously the land had been cropped with wheat at intervals and the first section of the pasture was established on "stubble ground" which was ploughed and sown with 5 lb. of Wimmera rye grass and 3 lb. of subterranean clover per acre. A cover crop of oats sown at 30 lb. per acre was put in and superphosphate was applied at the rate of half a bag per acre. The cover crop was stripped and 11 bags of oats per acre were taken off. Half a bag of superphosphate per acre was applied in 1943, but the field was given a bag per acre in 1944.

The pasture had recently carried 700 ewes and lambs which did well, except that the ewes were getting too fat. There was no worm infestation, no "pulpy kidney" and no "jaundice", although he had experience with jaundice in sheep three or four years ago after they had grazed "Wild Heliotrope".

Channeling on Mr. S. G. Hendy's farm.

The land under pasture was laid out on the border method. The bays were half a chain wide and ten chains long.

Although the paddock was being grazed and was somewhat irregular, it made a striking exhibit. The herbage was mainly clover in very fresh condition with rye grass scattered through. The area had been watered uniformly.

### *The Lucerne Competition*

First prize for the best five acres or more of irrigated lucerne was awarded to Mr. W. T. Buzza, whose lucerne block of 6 acres was sown in October, 1941 on land which had not been cropped for the previous 16 years.

In preparation the land was ploughed in August of that year, cultivated and "graded" three times and the seed was drilled in after a fall of 80 points of rain. Seven pounds of seed per acre was sown mixed with 75 lb. of superphosphate. Germination at first was irregular but a complete "strike" was obtained by watering twice. During the first season the young lucerne was grazed and during the growing season it was watered three times.

A portable siphon tube for taking water from a lateral channel.

No manure was given in 1943 but the lucerne was cut five times and gave an aggregate yield of 7 tons of hay in the 1942-43 season. The land received a dressing of one bag of superphosphate in 1943 and it was grazed in the 1943-44 season. It was given another bag of manure in December, 1944 and the crop presented was the third crop for the season. The lucerne was shown in good condition and was a heavy crop in vigorous, fresh condition. Parts of it were irregular. The paddock was laid out for irrigation on the border method and the banks for the most part were covered.

Mr. W. P. Smith of Cobram East presented an exhibit of five acres of lucerne which had been established on old wheat land and had been sown broadcast at the rate of 10 lb. of seed per acre after oats and manure (1 cwt. per acre) had been sown with the combine. Mr. Smith adopted the conventional layout for irrigation on the border method. The land was in half-chain bays and 10-chain runs. This competitor is a very successful lucerne grower. He likes to sow lucerne in the period May to September, but has not had "pea mite" infestation. He does not scarify the lucerne land. He has no fixed opinion about manure, but considers one bag per acre every year a reasonable amount. He gives two irrigations for each growth, one after cutting and another a fortnight later. The lucerne exhibit was shown in the right condition. It was dense and uniform and free from weeds.

Mr. T. N. Harris exhibited an area of thirteen acres of lucerne three years old. It was generally good, and in parts was excellent but lost points through irregularities. In preparation for sowing, this area of old wheat land was ploughed and cultivated repeatedly. The land was graded and checkbanked and the banks were 18 chains long. Mr. Harris regarded this length as excessive because it causes the water to "get away". The exhibit had been topdressed with superphosphate at the rate of 140 lb. per acre. Mr. Harris would put on 300 lb. per acre every year if he could get the superphosphate. He did manure at that rate previously on old lucerne and it had a very marked effect.

PASTURE COMPETITION.

| Name of Competitor. | Layout of Land for Irrigation, Condition of Channels and Drains. | Condition of Pastures. | Balance of Species. | Uniformity. | Freedom from Weeds. | Total Points Awarded. |
|---|---|---|---|---|---|---|
| Maximum Points | 20 | 20 | 20 | 20 | 20 | 100 |
| Johnson, H. D. .. | 18 | 19 | 19 | 18 | 19 | 93 |
| Buzza, W. T. .. | 18 | 19 | 18 | 17 | 19 | 91 |
| Fairley, J. .. | 18 | 17 | 18 | 17 | 19 | 89 |
| Hendy, S. G. .. | 18 | 18 | 18 | 15 | 19 | 88 |
| Kennedy, L. .. | 18 | 18 | 17 | 16 | 19 | 88 |
| Smith, W. P. .. | 18 | 18 | 16 | 17 | 19 | 88 |
| Bott, J. .. | 10 | 19 | 18 | 16 | 19 | 82 |
| Harris, T. N. .. | 18 | 15 | 14 | 17 | 17 | 81 |
| Craig, Dick H. | 18 | 10 | 15 | 18 | 18 | 79 |
| Cooper, J. .. | 17 | 17 | 5 | 14 | 17 | 70 |

LUCERNE COMPETITION.

| Name of Competitor. | Layout of Land for Irrigation, Condition of Channels and Drains. | Yield of Hay the Crop would Produce at Inspection. | Condition of Crop. | Uniformity. | Freedom from Weeds. | Total Points Allotted. |
|---|---|---|---|---|---|---|
| Maximum Points | 20 | 20 | 20 | 20 | 20 | 100 |
| Buzza, W. T. .. | 18 | 20 | 19 | 18 | 19 | 94 |
| Smith, W. P. .. | 19 | 18 | 18 | 19 | 19 | 93 |
| Harris, T. N. .. | 17 | 18 | 19 | 18 | 19 | 91 |
| Craig, Dick H. | 18 | 15 | 18 | 18 | 19 | 88 |
| Fairley, J. .. | 17 | 16 | 18 | 17 | 19 | 87 |
| Kennedy, L. V. | 18 | 14 | 18 | 18 | 19 | 87 |
| Johnson, H. D. .. | 18 | 14 | 17 | 17 | 18 | 84 |
| Smith, P. J. .. | 19 | 11 | 17 | 17 | 19 | 83 |
| Blyth, I. .. | 18 | 4 | 18 | 18 | 19 | 77 |
| Fleming, I. W. | 19 | 7 | 15 | 15 | 18 | 74 |
| Donellan, M. .. | 19 | 4 | 10 | 15 | 19 | 67 |

# Cereal Variety Trials in the Mallee, 1944

By H. J. SIMS, M.Agr.Sc., Dip. Com., Manager, Mallee Research Station, Walpeup

Seeding a Mallee fallow with the combine.

### *Seasonal and District Conditions*

One of the worst droughts experienced in the history of the Mallee occurred in 1944 and crops throughout a large portion of the area were complete failures. Following the drought of 1943 farmers were hopeful of a good season at the beginning of the year, and made preparations to sow large areas. Fairly good rains fell in May and much crop was sown under favourable conditions. However, little useful rain was recorded after May although showers in July revived crops for a time.

At Walpeup the highest fall of rain for any one day was recorded in December after the crop had been harvested. In many districts sheep were turned into the crops in the spring and this enabled many fat sheep and lambs to be disposed of. The lack of feed throughout the area and the heavy grazing of whatever feed there was has left the country very bare and liable to erosion. Under these conditions, dust storms have been bad throughout the summer.

TABLE 1.—RAINFALL DATA AT WALPEUP.

| Month. | Rainfall 1944. | No. of Falls. | Rainfall, 1943. | No. of Falls. | Average 33 Years., 1912–43 |
|---|---|---|---|---|---|
| January .. | 20 | 2 | 61 | 4 | 69 |
| February .. | 18 | 3 | 15 | 3 | 83 |
| March .. | 39 | 5 | 10 | 2 | 73 |
| April .. | 47 | 7 | 99 | 12 | 77 |
| May .. | 156 | 11 | 31 | 7 | 120 |
| June .. | 16 | 4 | 73 | 12 | 127 |
| July .. | 97 | 10 | 63 | 12 | 116 |
| August .. | 16 | 4 | 132 | 15 | 129 |
| September | 48 | 6 | 151 | 13 | 133 |
| October .. | 89 | 10 | 150 | 12 | 138 |
| November | 53 | 8 | 82 | 5 | 89 |
| December | 106 | 5 | 72 | 2 | 92 |
| Total .. | 705 | 75 | 939 | 99 | 1,246 |
| Rainfall— April–October | 469 | 48 | 699 | 83 | 840 |

Best crop yields were obtained in the central and western parts of the Mallee, e.g., along the Ouyen-Panitya line, and in the Hopetoun,

Yaapeet, and Rainbow districts. In common with surrounding districts, light yields (up to nine bushels per acre) were obtained at the Mallee Research Station but the experimental plots on farmers' properties in the southern Mallee were failures, the only ones harvested being those of a manurial trial on a sandy site at Woomelang and here the best yield was less than six bushels per acre.

## *WHEAT VARIETY TRIALS*

The 1944 yields at Walpeup, together with the averages for a period of years, are given in Table 2, while the yields for a period of years at the southern Mallee centres are shown in Table 3.

It will be seen that the highest yield has been given by the new crossbred wheat Ghurka x Ranee M6173 T14-2-1-1. This cross-bred, which was bred at the Mallee Research Station, has been doing particularly well in all Mallee trials.

TABLE 2.—WHEAT VARIETY TRIALS, MALLEE RESEARCH STATION.

| Variety. | 1944. | Average Five Years, | Average Eight 1937–44. |
|---|---|---|---|
| | bus./ac. | bus./ac. | bus./ac. |
| Ghurka x Ranee M6173 .. | 8·5 | 19·6 | .. |
| Regalia .. .. | 8·1 | 17·8 | 23·1 |
| Baldmin .. .. | 7·4 | 17·1 | 23·0 |
| Bencubbin .. .. | 7·2 | 18·1 | 23·4 |
| Ghurka x White Fife L5266 | 6·6 | 17·7 | .. |
| Quadrat .. .. | 6·2 | 18·1 | 23·7 |
| Ghurka .. .. | 5·8 | 16·5 | 20·4 |
| Ranee 4H .. .. | 5·8 | 17·2 | 22·4 |
| Ghurka x Pusa 4 M4510 V9–2 .. .. | 5·8 | 17·6 | .. |
| Pindar .. .. | 4·8 | 17·1 | 22·4 |

Ghurka x Ranee M6173 is an early-maturing comparatively short-strawed cross-bred with a rather short, compact, brown-chaffed head. It is fairly resistant to flag smut and has desirable harvesting characteristics. In grain quality, it is superior to Ghurka and approximately equal to Ranee 4H. However, like its Ghurka parent, it has short straw and this is a disadvantage where there is a likelihood of competition with weeds such as mustard or wild turnip. If seasonal conditions are favourable for its multiplication, it is hoped that this variety will be named and distributed to farmers after the 1945 harvest.

Named varieties that have given best yields are Bencubbin and Quadrat. Bencubbin is now well known to most Mallee farmers and its yielding ability is undoubted. Farmers, particularly in the southern Mallee, realize that this variety has shortcomings with regard to the strength of its straw and make due allowance for this by sowing only easily handled areas. Quadrat is not so well known but it has given satisfaction wherever tried. It is a late mid-season variety of similar maturity to Ghurka, is slightly taller in the straw, has a bolder head and has given better yields than that variety.

TABLE 3.—WHEAT VARIETY TRIALS, SOUTHERN MALLEE CENTRES.

| Variety. | Woomelang. Average Four Years, 1941–44. | Ultima. Average Four Years, 1941–44. | Berri-Willock. Average Five Years, 1940–44. |
|---|---|---|---|
| | bus./ac. | bus./ac. | bus./ac. |
| Ghurka x Ranee M6173 .. | 20·5 | 8·7 | .. |
| Quadrat .. .. | 16·0 | 7·2 | 16·9 |
| Bencubbin .. .. | 20·0 | 8·4 | .. |
| Regalia .. .. | 19·8 | 8·6 | 14.5 |
| Pindar .. .. | 15·0 | 7·0 | 15.6 |
| Ranee 4H .. .. | 19·2 | 8·1 | 14.8 |
| Baldmin .. .. | 19·3 | 7·4 | .. |
| Ghurka .. .. | 14·5 | 7·2 | 15·3 |

New varieties from other States are being watched with interest. Such recently-named varieties include Javelin, Ridley, Scimitar, and Warigo, from South Australia; Kondut and Koorda from Western Australia, and Charter from N.S.W.

The recommendations of the Victorian Wheat Advisory Committee for the Mallee are—

| District. | General Sowing. | Limited Sowing. |
|---|---|---|
| Northern Mallee | Regalia<br>Ranee 4H<br>Ghurka<br>Bencubbin | Pindar<br>Baldmin |
| Southern Mallee .. | Ghurka<br>Ranee 4H<br>Regalia<br>.. | Quadrat<br>Pindar<br>Bencubbin<br>Baldmin |

## *OAT VARIETY TRIALS*

Owing to the drought conditions oats on stubble were practically a complete failure in 1944. Because of their early maturity, oats of the Mulga type gave best yields, though

light, but no plots returned a crop that, under ordinary circumstances, would be cut for hay.

Yields of the main varieties over a seven-year period are:—

TABLE 4.—OAT VARIETY TRIALS—MALLEE RESEARCH STATION.

| Variety. | Hay Yield on Stubble. | | Grain on Stubble. | Hay on Fallow. |
|---|---|---|---|---|
| | Seven Years, 1938–44. | Five Years, 1940–44. | Seven Years, 1938–44. | Five Years, 1940–44. |
| | cwt./ac. | cwt./ac. | cwt./ac. | cwt./ac. |
| Algeribee .. | 15·8 | 14·9 | 13·8 | 21·0 |
| Dawn .. .. | 15·6 | 14·5 | 13·6 | 23·0 |
| Mulga .. .. | 15·3 | 13·0 | 14·0 | 22·5 |
| Palestine x Dawn M5126 R4-1-1 | 14·9 | 12·8 | 15·8 | 21·1 |
| Algerian .. | 14·6 | 13·8 | 13·6 | 19·1 |
| Fulghum .. | 14·4 | 12·6 | 13·9 | 20·6 |

It will thus be seen that over a period of years best results have been given by Dawn, Algeribee, and Mulga, and that all these varieties have outyielded the standard Algerian.

From the grazing point of view, best early grazing has been given by the earlier-maturing varieties such as Mulga and Dawn, while Algeribee and Algerian do best at later grazings. Greatest total grazings was obtained from Palestine x Dawn M5126 R4-1-1, Fulghum, Mulga, and Algeribee.

No one oat variety is the best for all purposes, and experience has shown that it is desirable to sow more than one variety. This enables maximum advantage to be taken of seasonal conditions, enables the harvest to be spread over a longer period (this is important when man power for handling the harvest is so short) and, if the crop is to be grazed, gives a greater spread of grazing time.

Bearing these points in mind, the following recommendations are made concerning oat varieties for Mallee sowing:—

For hay and grain—

Mulga (early-maturing).
Dawn (mid-season).
Algeribee (late-maturing).

For grazing and recovery to produce a crop—

Fulghum (early maturing).
Algeribee.
Dawn.
Mulga (for early grazing).

The shortage of seed oats is most pronounced this year and many people will have to use wheat for sowing for hay and for grazing. However, growers should try to get a small amount of seed oats to build up for next year's requirements.

In view of the serious depletion of fodder reserves during the last two years of drought, a wise course for farmers to follow would be to sow a proportion of their hay crop on fallow. This practice should greatly increase the chances of replacing quickly their lost reserves.

Comparative yields of oats for hay on fallow and stubble are given in Table 4. From these it will be seen that greatly increased yields can normally be expected from fallow sowing, although after a drought, fallowed land may be little, if any, better than land on which crop failed.

## *CEREAL BREEDING*

During the early part of the war the cereal work of the station was reduced considerably and it cannot be built up to its former scope while the war lasts. However, as the breeding, fixing, and selection of a new cereal variety takes approximately ten years, a start is being made to do more work in the stud rows and to have new material ready for testing when the opportunity arises.

Points kept in mind in the breeding programme include:—In wheat breeding continuous attempts are being made to breed higher yielding varieties. At the same time a minimum standard for quality is set and new cross-breds not coming up to this standard are not persevered with. In this way it is hoped to increase the quality of new wheats as well as to increase yield. Other factors given prominent attention include strength of straw, good threshing ability, disease resistance (particularly to flag smut) and generally good agricultural characters.

In regard to oats, particular attention is now being given to the production of an oat variety that gives good grazing and also has good recovery power for successive grazings or for a grain yield after grazing.

If sheep are to occupy a prominent place in Mallee farming it is necessary to make adequate provision for them, and green oats and oat grain are two excellent feeds. Having a reserve of grain or other fodder on the farm is particularly important in a year such as that just experienced, but hand feeding can be

carried out to advantage in all except the best seasons.

Other points considered in regard to oats in addition to yielding ability for both hay and grain, include strength of straw and ability to stand up to adverse weather conditions.

In the reduced programme that has been maintained during the war, the testing of the best of the cross-bred material has been continued and, as indicated in the foregoing, it is hoped to release a new wheat variety (Ghurka x Ranee M6173) next year. In addition, a small amount of seed of an oat variety (Palestine x Dawn M5126 R4-1-1) suitable for grazing and recovery was distributed to farmers for trial last year and more of this should be available after the 1945 harvest.

# William Farrer Centenary

On the 3rd April, 1945, Australia celebrated the 100th anniversary of the birth of one who has been described as its greatest benefactor—William James Farrer.

Farrer commenced his wheat breeding researches in New South Wales in 1885, at a time when our wheat varieties were of inferior quality and when yields were so erratic as a result of the ravages of rust and drought that wheat had to be imported to meet local requirements.

The phenomenal increase in the yield per acre and in the total yields for wheat produced in Australia for several decades from 1910 onwards, was a direct result of Farrer's pioneering work. Farrer's wheats over a period of years averaged up to six bushels an acre more than the old varieties.

Farrer commenced his work in a new and uncharted field. He was neither trained nor experienced as an agriculturist, yet by his painstaking work, his careful observations and, above all, his intelligent interpretation of those observations, he gave this country wheats which resulted in an extension of the wheat belt, wheats of better yielding capacity and wheats which permitted development of an export trade on the world's markets. His most spectacular result was the production of the wheat variety Federation, a variety which even a quarter of a century after his death was widely cultivated in Australia.

W. J. Farrer.

Although Farrer died in 1906, his work still goes on. During the last 40 years other plant breeders and other investigators have made their contributions to the national welfare, but Farrer's life and work should be a constant source of inspiration to us all. Truly may he be regarded as a great Australian.—(*Farrer Memorial Trust.*)

# Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

## *Fibre and Bulk in Feeding Stuffs*

THE constituents of animal feeding stuffs are usually classified as proteins, fats, carbodydrates, mineral matter and moisture.

The carbohydrates which are used for the production of heat, energy and fat in the animal body may consist of easily digested sugars and starch, or fibre which is more difficult to digest, except perhaps in the case of ruminants.

Fibre is the term given to the class of carbohydrates used mainly in the formation of the cell walls of plants, and its value for feeding purposes varies according to its condition and the kind of animal that consumes it.

The fibre content of growing plants increases and its digestibility decreases as the plants mature. Thus when compared on a dry matter basis succulent and closely grazed pasture contains about 16 per cent. of fibre while the same type of pasture at the flowering stage contains about 28 per cent. of fibre. Similarly oats, barley, wheat, maize, and other fodder crops have a much greater proportion of fibre at the flowering stage than at the feeding-off stage.

Feeds that are high in fibre such as hay, straw, silage, oat hulls, and low-grade mill screenings are termed roughages to distinguish them from concentrates which are low in fibre. Examples of concentrates are cereal grains, wheaten pollard, and dried milk by-products.

Although crude fibre is fairly resistant to the digestive juices of animals, considerable digestion is brought about by micro-organisms in the digestive tract so that fibre makes some contribution to the nutrition of the body. Ruminants can assimilate more of the fibrous material of roughages than horses or pigs, while poultry have practically no power to digest fibre.

Some bulk is necessary to keep active the voluminous organs of ruminants and horses which are accustomed to dealing with large masses of food, and they will not do their work efficiently with concentrated fodder alone. Where large amounts of concentrates are being fed, fibrous foodstuffs are useful in supplying bulk to fill the animal's stomach, thus satisfying its appetite, and also in aiding digestion by preventing the finer parts of the ration from caking together and hindering the action of the digestive juices.

About two-thirds of the nutrients required for mature idle horses are necessary to maintain the body temperature, so that good quality roughages which are usually cheaper than concentrates and which furnish a large amount of heat in the body are usually economical as maintenance rations.

In the feeding of heavy-producing dairy cows, horses doing hard work, pigs, poultry, and very young stock generally, fibre frequently has certain disadvantages. In addition to being relatively indigestible itself, intact fibre may hinder the action of digestive fluids on other nutrients enclosed within the plant cell walls. There is, therefore, a limiting factor in feeding certain roughages, since the volume it would be necessary to consume would be so great in proportion to the amount capable of being digested that the animal would be underfed in spite of the bulk.

A good ration is one which includes in its bulk sufficient nutriment to provide for maintenance and the desired amount of production without overloading the stomach.

[J. T. Kelly, B.Agr.,Sc., Science Field Officer.]

### *Horses*

With the expected approach of autumn and early winter rains, horses all over Victoria will shortly be put into harness to start on the heaviest part of the year's work—ploughing and seeding. Now is the time to make preparations for this period of hard work.

Owing to the abnormal drought conditions which have affected so much of Victoria for so long, certain factors, in addition to the usual ones met with at this period, must be taken into consideration. Over the past months a great many horses have been on agistment in southern areas of Victoria, and during these months have done little or no work. On their return to the home properties a period of acclimatisation will be necessary before they are put to work. This period of rest and acclimatisation will be all the more essential where the horses have had a long, slow train journey from the property of agistment, and are consequently fatigued. During this period a process of "toughening up" should be undertaken. As part of this process, and indeed as a main essential of it, care must be taken with the ration supplied. The horse on agistment will have been grazing largely on pasture, and a sudden change, after a period of fasting during the train journey, to a dry fodder containing a high protein content would almost certainly entail the risk of digestive disorders. Consequently, at the outset, light feeds should be the order, and the amount of concentrate, in the form of grain, increased gradually.

As the teeth of horses often wear irregularly especially those of older horses, leaving sharp points or jagged edges which cause pain and result in improper mastication of food, it would be advisable to examine the teeth of all horses and to remove any sharp edges, &c. by the use of a guarded rasp.

As most farm horses are worked unshod, particular attention should be given to the feet. All horses should be inspected, and all overgrown dead horn removed so as to give a sound even-bearing surface to the sole of the hoof. Horses with badly split hooves should be shod.

The heavy coat which the horse grows for winter protection often causes it to sweat unduly when at work, and, because of this fact, the trace-high clipping of working horses is a decided advantage. This clipping allows the horse to dry much quicker, and renders him less liable to chills. It also greatly facilitates grooming, which should be a feature of the daily routine.

During the period of rest and "toughening up" for the horse, opportunity should be taken to thoroughly overhaul the harness. Those parts which should be soft and pliable should be made so by the application of neatsfoot oil. All padded parts should be made even and free from lumps and abrasive surfaces, which might injure the skin of the horse when full traction is applied.

[A. R. Grayson, B.V.Sc., Veterinary Officer.]

### *Lamb Marking*

The following points should be observed when lambs are being marked:—

Lambs should be marked when a fortnight old, but strong lambs may be marked earlier.

Use clean temporary yards wherever possible. Where permanent yards are used, cleanse them thoroughly before each operation. Erect the temporary yards in the paddocks where the lambs are being grazed.

Keep the marking board scrupulously clean and scrubbed with a suitable disinfectant solution such as lysol.

Sterilize all instruments immediately before and after each marking, and disinfect the instruments and hands regularly during the operations.

Handle the lambs carefully and drop the newly marked lambs gently on their feet on to clean pasture.

Finish marking early each day so that bleeding ceases and the lambs have ample time to mother up before the cool of the afternoon.

Mark only on a calm, fine day. Avoid marking during wet, windy, cold, or very hot days.

### *Vitamin A. for Pigs*

On a recent visit to a farm, the writer was told that the growing pigs had very little appetite. Inspection revealed the pigs in clean, comfortable pens with concrete floors; it being summer they had no bedding. They were fed twice daily with a wet mash of crushed wheat, meatmeal, lime and salt, and they had water to drink. The pigs had been penned for about two months, and prior to that had been kept in bare earth yards.

The pigs were lying down and when forcibly stirred up some seemed to have difficulty in getting on to their feet, and all were slow to move after they had risen. They were small for their age.

It was a long time since these pigs had eaten green food or any other good source of vitamin A, and their mothers had had very little of such foods when they were carrying and suckling these pigs. This history and the appearance of the pigs led to the conjecture that a deficiency of vitamin A was the primary cause of the decreased appetite and unthriftiness in the pigs.

A course of fish-liver oil, if obtainable, as an immediate remedy for the condition, and the provision of fresh, green food or green lucerne chaff as a component of the pigs' daily ration were recommended, and a warning was given that the mothers of these growing pigs would probably show the effects of prolonged deficiency of vitamin A by producing weak pigs at their next farrowings and by having a poor milk supply unless prompt action was taken to replenish their depleted reserves of vitamin A.

Farmers for ages have known that green food is essential to the health, growth and reproduction of animals, and, more recently, scientists have discovered that vitamin A is the important factor supplied to animals by green food.

Despite this accumulated knowledge, substantial loss still occurs in live stock industries through deficiency of vitamin A.

Under some conditions of stock raising it may not be practicable to do much about remedying the deficiency, but intensive animal husbandry such as modern pig raising demands action to ensure an adequate supply of vitamin A.

Many foods supply the precursor of vitamin A. They include green pasture and crops, yellow maize, carrots, pumpkins and green, leafy, legume hay, while certain fish-liver oils, although not usually classed as stock foods, are sometimes used as a supplementary source of vitamin A.

Animals are capable of storing sufficient vitamin A within their bodies to carry them through a period when their intake is lower than their requirements; that is probably nature's precaution against normal dry seasons when green food is not available to stock.

Unfortunately there are no very obvious early danger signals to herald the depletion of the body reserves of this vitamin in pigs, and the first signs are serious. They include degrees of infertility in sows and boars, lack of vitality in newly born pigs, poor milk supply of suckling sows, slow growth, and increased susceptibility to infection in young pigs.

The provision at all times, where practicable, of fresh green fodder or green lucerne or clover hay is strongly recommended. In the absence of such fodders, recourse should be had to a fish-liver oil rich in vitamin A. However, the supply of these oils at present is restricted and irregular.

Fish-liver oils are expensive and have another serious limitation in their detrimental effect on the quality of bacon cured from pigs which have been fed on fish oils during the second half of their life. For these reasons fish-liver oils or their emulsions should only be fed as an emergency measure.

A small plot of lucerne near the piggery, watered by a sprinkler, has proved a good investment to many pig raisers.

[L. A. Downey, H.D.A., Pig Expert.]

## *Table Ducks*

Ducks can be raised with success on mixed farms, but are not so well adapted as fowls to supply the major source of income, and careful consideration should be given to the whole question before an attempt is made to rear ducks on a large scale. When kept in small numbers, however, ducks serve to add variety to the meat and eggs for the owner's table.

In Victoria ducks are kept chiefly for table purposes, although some poultrymen keep small flocks for egg production. Breeds suitable for table purposes are the heavy types, such as Aylesbury, Pekin, Aylesbury and Pekin cross, and Muscovy.

Muscovy ducks have very deservedly acquired a good local reputation for table purposes. In Victoria they are kept to a much larger extent than any other breed, and are good sitters and careful mothers. They have a quiet temperament, and do not run about much, or lose condition by excessive exercise. Hence they can be kept successfully while local prices are good.

A suitable site for keeping ducks is on well-drained land, composed of light or sandy soil. There should be sufficient land for the growth of green food. Shade is essential, and the birds should be protected from the cold winds.

Houses for ducks should have sufficient ventilation, dry floors, and protection from prevailing winds. They may be built similar in design to ordinary poultry houses, facing north or north-east when possible, in order that the floors may receive as much sun as possible. They should be open-fronted, with a space for ventilation at the top of the back wall. This opening could be closed by means of a hinged board during inclement weather. If an outside run is provided, the size of the house may be estimated by allowing two to three square feet of floor space for each duck. The birds should be kept warm and comfortable at night by covering the floor with clean straw, sand, or other dry material.

The strongest ducklings are produced from eggs of well-matured, strong, vigorous stock. With the heavy breeds like the Muscovy, one drake can be mated to about three to five ducks. Ducks in breeding pens should be kept strictly to themselves, and in cold weather comfortably housed to secure a normal egg supply. About 25 ducks in each pen is a suitable number. No hard and fast rule can be laid down as to the number of ducks that should be kept in one flock, either for breeding or other purposes, but the beginner will probably be more successful with comparatively small numbers. For egg production the breeding season for ducks usually extends from about July to September, but with heavy breeds the breeding operations may be continued throughout the year, provided foodstuffs are available and reasonably priced. The producer would also find it to his advantage if he reared his birds to mature during periods when they are in greatest demand.

Ducklings can be successfully hatched in incubators by skilled poultrymen, and also under hens and brooded in the same way as chickens. Muscovys usually are hatched under the ducks themselves. When breeding from Muscovys, all that is necessary is to place the nest containing a little sand and litter in a convenient position, and the duck will complete her own nest. The period of hatching for Muscovys is 35 days, but for all other breeds of ducks the period is 28 days.

Muscovy ducks are best reared with the mother ducks. If good growth and health are to be maintained, it is important that the young ducklings receive plenty of sunshine from an early age.

The principal part of all duck rations is fed as a wet mash. At the commencement, a good chick mixture, formed into a moist mash, has given satisfactory results. The following rations are recommended:—

| Ingredients. | Mash Mixtures. | | |
|---|---|---|---|
| | 1. | 2. | 3. |
| | lb. | lb. | lb. |
| Ground Wheat .. .. | 40 | 30 | 50 |
| Ground hulled oats .. .. | 20 | 10 | 30 |
| Ground maize .. .. | 20 | 40 | .. |
| Bran .. .. .. | 10 | 10 | 10 |
| Dried buttermilk .. .. | 10 | 5 | .. |
| Meatmeal .. .. .. | .. | 5 | 10 |
| Common salt .. .. | ½ | ½ | ½ |

If desired, 3 lb. of bone meal may be added to the above mixture, but, although widely advertised, the feeding of charcoal is not recommended.

In addition, ducklings should be given an ample supply of chaffed fresh green food daily. The young birds are usually fed all that they will eat four times daily, until they are two to three weeks old, and then three times daily until well grown. At four or five weeks of age they may be fed a similar ration to the mature ducks. Suitable mixtures are as follow:—

| Ingredients. | Mash Mixtures. | | |
|---|---|---|---|
| | 1. | 2. | 3. |
| | lb. | lb. | lb. |
| Ground wheat or ground barley.. | .. | 30 | 35 |
| Wheat pollard .. .. | 40 | 30 | .. |
| Ground oats .. .. .. | 20 | 30 | 35 |
| Bran .. .. .. | 30 | .. | 20 |
| Meatmeal .. .. .. | 10 | 10 | 10 |

Not less than 25 per cent. of chaffed succulent green food should be added to the above. Skim milk or boiled fresh meat may be used to replace meatmeal. The meat may consist of various carcasses, bullocks' heads, livers, &c., and the soup from these mixed with the mash. Meatmeal can be fed when these cannot be obtained. The above mashes should be fed morning and evening.

Clean drinking water must be kept continually before the birds, and it should be placed in deep drinking vessels. If ducks are without drinking water for even a brief period they are likely to become overheated, and when watered drink to excess. This may cause sickness or even death from cramp. Shellgrit should be kept continually before the birds.

Pekins and Aylesburys can be marketed when they are from nine to twelve weeks old, and weigh from 4½ to 6 lb. After the age mentioned the flesh deteriorates, and their weight decreases. Muscovys should be retained until they are between fourteen and sixteen weeks old, when they should be at their best.

[H. F. Clinton, Poultry Expert.]

### *Bee-keeping*

Preparations should now be made for wintering down the bee colonies. It is advisable to make a compact brood nest and remove all surplus supers not required by the bees.

Sufficient stores of good quality should be provided and about 40 lb. of honey is sufficient to carry a strong colony over the winter, if nothing is available until spring bloom.

It is a good plan to crowd the bees down until they cover all combs containing stores of honey. This somewhat counteracts fermenting of the unsealed stores as the bees are able to drive the moisture from the cluster area.

The ideal winter hive cover allows for ventilation, and is waterproof. The use of rubberoid and tar paper mats is not to be recommended, as they cause the hives to sweat and accumulate moisture, which is absorbed by the stores, causing souring, which in turn causes dysentry and winter losses.

Colonies that are light in stores should be kept under observation, especially in early spring when brood rearing gets under way. Ten pounds of surplus honey should always be available to each colony. This margin always gives the colony and queen some security to go on brood rearing. It will repay tenfold when the honey season eventuates.

Any queenless colonies can be united to a normal or "queenright" colony. A good method of uniting is to place the queenless colony over the normal colony with a sheet of newspaper between the two hive bodies. The bees will gnaw away the paper and unite quietly.

If colonies require feeding, combs of honey can be given from colonies with a large surplus.

If no combs of honey are on hand, sugar syrup can be given. Sugar syrup is made by thoroughly mixing equal parts of sugar and hot water. Allow to cool before feeding. A 7-lb. honey tin with a perforated lid makes an ideal feeder. Fill and replace the lid and invert it over the cluster inside an empty hive body. Packing should be placed around the feeder to prevent the escape of heat from the colony below.

Extracting equipment should be thoroughly washed and cleaned before it is stored. Any residue of honey left on the extracting baskets for a long period causes discolouration and rusting, which is extremely difficult to remove.

Surplus dry combs can be tiered up in supers in the open and made mouse proof. They will be safe from wax moth during the winter months. If any moths are found to be at work in September, the combs can be treated with carbon bisulphide.

[W. A. Collins, Apiary Inspector.]

# War Agricultural Committee Notes

## Compiled by the Central Executive

THE problem of providing a sufficient number of tractors of a suitable size to meet the needs of Victorian wheat farmers is becoming more urgent as sowing time approaches. Although urgent requests to American authorities have been made to secure the greatest number of tractors possible from overseas, the number which will be available will be much below that actually required.

Considerable assistance in meeting this difficult situation has been received by the Department of Agriculture from other Governmental bodies, in particular the Allied Works Council and the Commonwealth Flax Production Committee.

A short while ago advice was received that a number of tractors had been allocated to Australia for agricultural use to help overcome the present difficulty. Unfortunately, it appeared that the arrival of these tractors in this country would be too late for the seeding in most Victorian districts. The position was explained to the Allied Works Council which fully appreciated its seriousness and, as a result, agreed to make available to farmers a number of their tractors on the understanding that an equal number would be replaced from the promised shipment.

Assistance of a totally different nature has been offered by the Commonwealth Flax Production Committee. This organization has a number of tractors, which it is prepared to make available to farmers on hire during the period April to October, 1945. However, hire is restricted to those farmers whose properties are within a radius of 50 miles of the flax mill concerned. Although these tractors are smaller than those usually required by wheat farmers, they should prove of considerable value, particularly on small farms.

It is hoped that this offer may pave the way for similar offers from other bodies whose tractors have a slack period at the present time.

The need to ensure that the fullest use is made of all available tractors has been stressed on many previous occasions. Farmers have been asked personally and through the Press to co-operate with their neighbours, and to temporarily assist those who are unable to obtain a tractor of their own, and the Local War Agricultural Committees have co-ordinated these efforts and brought together, where necessary, those willing to assist and those requiring assistance. The results of these appeals have been gratifying, and in practically every wheat-growing district large areas will be sown by co-operative effort.

In the Charlton district alone 40 tractor owners have indicated that they are willing to assist their neighbours in this manner, while similar reports are being received from War Agricultural Committees in other areas.

Assistance has also been forthcoming from several tractor owners outside the cereal-growing districts. In one such instance in the Swan Hill district a large fruit-growing company which owns three tractors kindly made all three available for use in sowing wheat crops. At Horsham a similar company has made its two tractors available. Arrangements were made through the War Agricultural Committees to place these tractors where they were most required. A further nine tractors have been made available by dried vine fruit growers in the Mildura district for work in nearby areas, and it is anticipated that a number of other growers will make similar offers in the near future. It is hoped that fruitgrowers in the Mildura, Swan Hill, and Goulburn Valley districts will take this opportunity to repay the valuable assistance which wheat farmers have given in the picking of fruit crops.

Although results so far have been gratifying, much still remains to be done if the maximum acreage of hay, oats, barley, and wheat is to be sown. An appeal is made, therefore, to any farmer who may be able to assist in this matter to contact either the Local or District War Agricultural Committee in the area in which he resides. Every offer of help will be welcome and tractor owners will be assisted to find work with farmers prepared to pay the contract rates operating in the district for work performed.

# Citrus By-Products as Stock Food

By J. T. KELLY, B.Agr.Sc., Science Field Officer

CITRUS by-products have been used as stock food in the United States of America on a large scale for more than twenty years, and experimental work to determine the palatability, digestibility and nutritive value of the various residues have been carried out principally in Florida and California.

Citrus pulps are the by-products in the manufacture of juices, oils, citric acid, pectin and other extracts, and usually consist of the peel, the "rag" (residue of the inside portion), the seeds and cull fruits.

The refuse is used mainly in the dried form, only a small amount being fed fresh. Little reference is made to the feeding of fresh orange, grape fruit or lemon pulp, and the writers are cautious when making statements concerning its value.

Mead and Guilbert(1) state that wet orange pulp is a satisfactory feed for dairy cows and that dairymen near the factory were feeding it with apparently good results.

Neal and others (2) say that there is some evidence that the citrus peel oil in the fresh refuse will flavour milk when fed to cows in production, and do not advise the feeding of the fresh product except to dry cows. In referring to a trial at a Californian Station where no mention was made of any flavour in the milk when cows were fed up to 20 lb. of fresh pulp per head daily, these writers say that the oils may have been extracted during the processing. This particular trial indicated that orange pulp was equivalent to fresh beet pulp for production, but the nutritive value of fresh beet pulp in America is considerably higher, principally owing to the lower water content than the Victorian product, hence the big difference in the nutritive value between orange pulp and sugar beet shown in the table in the next column.

Two characteristics of dried citrus pulp probably apply to the wet pulp also. These are:—

1. A laxative action when fed as a large proportion of the ration.

2. Palatability.—Dried grape fruit refuse and dried orange pulp have been shown to be equally palatable and after having been fed a meal of corn silage and mixed grain cows would eat one pound of the product without mixture with other food. However, it seems necessary for the dried product to be mixed with more palatable feeds to induce stock to consume any appreciable amount. Hereford heifers in the United States of America were fed 30 lb. sugarcane silage, 15 lb. dried grapefruit refuse and 5 lb. cottonseed meal daily per 1,000-lb. weight. Dried lemon peel on account of the bitter taste is not palatable to stock, and must be mixed with better-liked feeds.

The following table compares the feeding value of fresh orange pulp with feeding stuffs of a similar nutritional value. The composition and food values of the orange pulp are of American origin, being tabulated in Morrison's *"Feeds and Feeding."* (3) Analyses and food values of the other fodders are taken from Hewitt's *"Foods and Feeding."* (4)

NUTRITIVE VALUES

| | Moisture. | Dry Matter. | Digestible Protein. | Starch Equivalent. | Nutritive Ratio. |
|---|---|---|---|---|---|
| | % | % | % | *lb per 100* | 1 : |
| Fresh Orange Pulp | 80·0 | 20·0 | 1·3 | 15 | 12·8 |
| Potatoes .. .. | 75·5 | 24·5 | 1·1 | 18 | 17·5 |
| Oaten Silage .. | 71·0 | 29·0 | 1·2 | 12 | 12·6 |
| Sugar Beet .. | 77·0 | 23·0 | 0·9 | 13 | 19·1 |
| Sugar Beet Pulp (wet) | 93·0 | 7·0 | 0·4 | 6 | 13·7 |
| Green Maize .. | 82·0 | 18·0 | 1·0 | 8 | 9·7 |
| Apples .. .. | 84·0 | 16·0 | 0·2 | 12 | 40·0 |

The use of wet orange pulp is limited to the district in which the processing works are situated so that in the computation of rations containing the pulp, consideration must be given to the types of roughage and concentrates available in the locality. In the Mildura district where there is practically no permanent pasture, summer fodder crops such as maize, millet, oats and lucerne are grown, but cereal chaff and protein concentrates are in very short supply.

Orange pulp has a very low protein content and unless green forage is available difficulty will be experienced in procuring sufficient protein concentrates to provide a balanced ration for dairy cows.

Subject to palatability and the possibility of tainted milk, the rations set out would be suitable for dairy cows giving 2½ gallons of milk per day, it being assumed that small amounts of chaff, wheat and linseed meal or meat meal are procurable.

| —— | Ration 1. | Ration 2. | Ration 3. |
|---|---|---|---|
| | lb. | lb. | lb. |
| Orange pulp (wet) .. | 15 | 15 | 30 |
| Green fodder .. .. | 40 | 40 | 20 |
| Oaten chaff .. .. | 4 | 5 | 5 |
| Crushed wheat .. .. | 3 | 4 | 4 |
| Bran .. .. .. | 2 | .. | .. |
| Pollard .. .. .. | 2 | .. | .. |
| Meatmeal .. .. .. | .. | 1 | 1½ |
| Linseed meal .. .. | 1 | .. | .. |

The nutritional value of wet orange pulp is sufficient to maintain the condition of both store sheep and cattle either on its own or mixed with other roughage.

No literature concerning the feeding of citrus by-products to pigs seems to have been published, but orange peel lying uneaten in the troughs of pigs fed kitchen refuse suggests that they would be unpalatable.

The following information refers only to the manufacture of *dried* citrus by-products in the United States of America, and its feeding value for stock.

The average weight of cannery refuse in the United States of America, in the early 1930's was 65½ thousand tons per annum. This included cull fruit from the canneries as well as the pulp. Of the total weight of fruit processed for juice and "hearts", 65 to 75 per cent. remains in cannery waste.

The pulp is dried by first passing it through corrugated rollers which disintegrate the fibrous structure of the peel and express part of the water. It is then dried in a series of drying chambers. The final product consists of flakes and shreds somewhat coarser than beet pulp. It is hard and slightly brittle but the fresh texture is recovered by soaking. Part of the citrus peel oil is expressed in rolling.

Analyses and trials have shown that dried citrus by-products are low in protein and fibre, high in nitrogen free extract and highly digestible. They can therefore be considered as carbohydrate feeds.

According to the results of digestibility trials, orange pulp should have a feeding value approximately that of barley, dried beet pulp and other feeds of a similar nature, and it would seem that it could be substituted for such a feed as beet pulp and for at least a part of the carbohydrate feeds like corn.

The general effects of feeding dried citrus by-products are favourable as indicated by the thrifty appearance and the gloss on the coat of the stock. The particular constituent or constituents producing glossiness are not known.

Although no information is available, the amount of citrus by-products in Victoria may not be sufficiently large to make drying economical, in which case their use would be restricted to the districts where the processing works are situated.

**References**


(1) Mead and Guilbert, 1926. Digestion of Certain Fruit Products as Determined by Ruminants. Bul. 409. Univ. of Calif.

(2) Neal, W. M., Becker, R. B. and Dix Arnold, P. T., 1935. Feeding Value and Nutritive Properties of Citrus By-products. Bul. 275. Univ. of Florida.

(3) Morrison, F. B., 1936. Feeds and Feeding. The Morrison Publishing Co.

(4) Hewitt, A. C. T., 1941. Foods and Feeding. Dept. Agric. Vic.

# REGISTRATION of STALLIONS

## TWENTY-FIFTH ANNUAL REPORT

By R. J. deC. TALBOT, B.V.Sc., Chief Veterinary Inspector.

IN reviewing the operations of the Horse Breeding Act for the year 1944–45, the most significant feature is that the number of draught stallions registered was 367 compared with 500 for the previous year. The number of young draught stallions examined and certified was 61, as against 64 last year, so that the decline in numbers was mainly in the aged group and this, undoubtedly, may be largely attributed to the severe drought in the main horse-breeding districts of Victoria forcing owners to destroy old horses.

The number of all classes of stallions registered was 367 draught, 245 light, and 198 pony stallions, a total of 810, which was 102 less than the number registered for the previous year.

Since the year 1936–37 there has been a steady decline in the number of stallions registered under the Horse Breeding Act, and the number may still further diminish with an increase in power farming which many people anticipate will take place after the war.

During the present drought the horse population of Victoria has suffered severely through the disposal for slaughter, or direct slaughter on the farm, of more aged horses than usual, and the mating of fewer mares.

It is the writer's opinion that for some years following the breaking of the drought there will be a shortage of suitable farm horses, and every effort should be made by stud breeders to retain their best colts and mares.

During the year under review the number of stallions examined by the veterinary staff, with a view to registration, was 70 draughts, 66 lights, and 52 ponies, a total of 188. Of these 10 (5·31 per cent.) were refused registration because of unsoundness, and 13 (6·91 per cent.) because they were considered to be below a reasonable standard of type and conformation. 165 stallions were passed for registration.

The total percentage of rejections (12·22) is the lowest with one exception since the Horse Breeding Act came into operation in 1919, and indicates that horses which are being retained are those bred from sound stock and of the best type.

### *Bonus for Foals*

In 1941, with a view to encouraging the breeding of the best type of draught stock, the Government decided that a bonus of £2 would be paid to the owner of every foal the progeny of a registered draught stallion and a mare approved by the Chief Veterinary Inspector. To date £8,904 has been paid in respect of 4,452 foals.

Applicants for the foal bonus are reminded that all applications must reach the Department before the 30th June next

### *Two-year-old Colts*

In 1939 the Horse Breeding Act was amended to provide for the registration of two-year-old colts whose owners desired to give them some stud service. The amendment provides that owners must make application for registration on the prescribed form, and the application must be accompanied by a fee of £1. The colts must be submitted for examination at a scheduled parade, and, if passed, will be registered as a colt for one year. During the season 1944–45, 22 colts were examined. Of this number seventeen were registered.

### *Parades for the Coming Season*

Owing to the petrol restrictions, a schedule of stallion parades cannot be arranged for this season. Where possible, arrangements will be made to examine stallions at centres most convenient to those owners from whom applications have been received. Applicants should state which main town would be most suitable for them to present their stallions for examination, and they will, in due course, be advised of date, time, and place arranged for the examination.

Provided owners forward their applications by 1st July as is required, it is felt that by such an arrangement every stallion will be examined before the commencement of the breeding season.

Applications for registration must be made on the prescribed forms before the 1st July, and must be accompanied by a fee of £3 (£1 for registration and £2 for compensation fee) in respect of stallions fifteen years of age and under, and a fee of £1 1s. in respect of stallions

### *LIST OF UNREGISTERED STALLIONS RETAINED BY OWNERS FOR USE WITH THEIR OWN MARES*

Under the provisions of the Horse Breeding Act, the owner of any stallion, the registration of which has been refused, may, on payment of a fee of £1 per annum, and notification to the Chief Veterinary Inspector, retain such stallion for breeding purposes with his own mares only.

| Name. | *Age and Class. | Owner and Address. | Name. | *Age and Class. | Owner and Address. |
|---|---|---|---|---|---|
| Unnamed | A. L. | M. Cole, Kooreh | Majestic Knight | A. P. | Miss G. Small, Ferntree Gully |
| Alto Bells | A. P. | J. Barty, Redesdale | Manya Thrill | A. L. | E. W. Wheeler, Manya North |
| Baron Bold | A. D. | Mrs. D. A. Daly, Detpa | Merry Prince | 4 D. | W. A. J. Pearse, Nyah West |
| Benambra | A. D. | Nankervis Bros., Corryong | Model | A. D. | G. B. Wilson, Timboon |
| Ben Bowyang | A. D. | S. J. Wilson, Nar Nar Goon | Money King | A. L. | J. A. Bowland, Leitchville |
| Black Prince | A. P. | W. K. Thomas, Mt. Cole Creek | Noble | A. D. | Crowe Bros., Tatong |
| Black Star | A. L. | D. Madill, Koyuga South | Peter | A. D. | C. A. Deckert, Boinka |
| Bonnie Prince | A. D. | J. Moore, Woori Yallock | Pinto Pete | 4 L. | V. A. Hicks, Melbourne |
| Brae | A. D. | F. Wilson, Mepunga | Prince | A. D. | F. Justin, Camperdown |
| Bravia | A. T. | E. J. Wright, Flynn | Prince | A. D. | A. H. Fawson, Bairnsdale |
| Danny Boy | A. L. | W. Meagher, Danyo | Punch | A. D. | W. Earl, Woodside |
| Devon Point | A. L. | J. Manifold, Weerite | Pyjamas | A. P. | Boyd Bros., Koroit |
| Drummer | A. D. | F. Bird, junr., Yarram | Rob Roy | A. P. | Miss E. A. Small, Hawthorn |
| Duke Fort | 4 D. | G. E. Casey, Shepparton | Sand Storm | 4 L. | W. R. Coto, Sale |
| Ethaldale Scotson | A. D. | H. H. T. Kramer, Lawloit | Skylark | 3 P. | J. Skehan, Sale |
| Fairhaven | 3 D. | G. L. Boag, Stony Creek | Sordino | A. T. | L. Matthews, Benambra |
| Fifeness Flash Baron | A. D. | H. L. Treasure, Stratford | Sunset Trail | A. T. | Yarraberb Pty. Ltd., Raywood |
| Flash | A. P. | A. F. Sanders, Sale | The Vanquisher | 4 T. | Estate of E. J. Gleeson, Macarthur |
| Gay Peter | 4 L. | D. Moriarty, Cohuna | Waldairas King Knight | A. D. | Boyd Bros., Koroit |
| Glen McBride | A. D. | H. Jager, Swan Hill | Warrangee Oswald | A. D. | G. Lord, Eskdale |
| John McElwyn | A. P. | D. Bamford, Beeac | Worawingeth Allenby | A. D. | W. T. Rowe, Wallinduc |
| Kawarau Liston Craig | A. D. | V. O. Frost, Netherby | Young Harold | A. P. | W. J. Newton, Lower Cape Bridgewater |
| Keayang | A. D. | J. Blain, Dixie | Young Toby | A. D. | W. J. Newton, Lower Cape Birdgewater |
| Lee Wah | 6 L. | Mrs. M. J. Forster, Pyramid | | | |
| Lord Victor | A. D. | J. Montgomery, Milawa | | | |

*NOTE.—Age in years. A., aged; D., draught; L., light; P., pony; T., thoroughbred.

sixteen years or over sixteen years. The necessary forms may be obtained from the Chief Veterinary Inspector, Live Stock Division, Department of Agriculture, Melbourne, C.2.

Change of ownership must be notified without delay, in order that certificates of registration may be endorsed accordingly. Registration expires within 30 days of change of ownership, unless the required notice is given.

### *SUMMARY OF EXAMINATIONS, 1943–44.*

| | Draught. | | Light. | | Pony. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | Examined. 90. | Certificated. 64. | Examined. 75. | Certificated. 64. | Examined. 41. | Certificated. 38. | Examined. 206. | Certificated. 166. |
| | Rejected. | Percentage Rejected. | Rejected. | Percentage Rejected. | Rejected. | Percentage Rejected. | Rejected. | Percentage Rejected. |
| Bone Spavin | .. | .. | 1 | 1·3 | .. | .. | 1 | ·48 |
| Bog Spavin | 2 | 2·2 | .. | .. | .. | .. | 2 | ·96 |
| Chorea (Nervy) | .. | .. | .. | .. | .. | .. | .. | .. |
| Curb | .. | .. | .. | .. | .. | .. | .. | .. |
| Ringbone | .. | .. | .. | .. | .. | .. | .. | .. |
| Sidebone | 12 | 13·3 | .. | .. | .. | .. | 12 | 5·82 |
| Stringhalt | .. | .. | .. | .. | .. | .. | .. | .. |
| Thoroughpin | .. | .. | .. | .. | .. | .. | .. | .. |
| Through unsoundness | 14 | 15·5 | 1 | 1·3 | .. | .. | 15 | 7·26 |
| Through disapproval | 12 | 13·3 | 10 | 13·3 | 3 | 7·31 | 25 | 12·13 |
| Total | 26 | 28·8 | 11 | 14·6 | 3 | 7·31 | 40 | 19·39 |

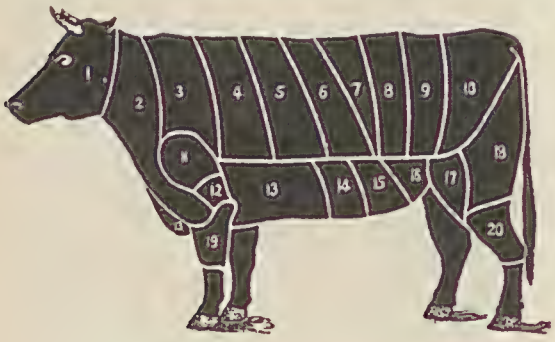
### *SUMMARY OF EXAMINATIONS, 1944–45.*

| | Draught. | | Light. | | Pony. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | Examined. 70. | Certificated. 61. | Examined. 66. | Certificated. 55. | Examined. 52. | Certificated. 49. | Examined. 188. | Certificated. 165. |
| | Rejected. | Percentage Rejected. | Rejected. | Percentage Rejected. | Rejected. | Percentage Rejected. | Rejected. | Percentage Rejected. |
| Bone Spavin | .. | .. | 1 | 1·51 | .. | .. | 1 | ·53 |
| Bog Spavin | .. | .. | .. | .. | .. | .. | .. | .. |
| Chorea (Nervy) | .. | .. | .. | .. | .. | .. | .. | .. |
| Curb | .. | .. | 1 | 1·51 | .. | .. | 1 | ·53 |
| Ringbone | 1 | 1·42 | .. | .. | .. | .. | 1 | ·53 |
| Roaring | .. | .. | 1 | 1·51 | .. | .. | 1 | ·53 |
| Sidebone | 5 | 7·14 | .. | .. | 1 | 1·92 | 6 | 3·19 |
| Stringhalt | .. | .. | .. | .. | .. | .. | .. | .. |
| Thoroughpin | .. | .. | .. | .. | .. | .. | .. | .. |
| Through unsoundness | 6 | 8·56 | 3 | 4·53 | 1 | 1·92 | 10 | 5·31 |
| Through disapproval | 3 | 4·28 | 8 | 12·12 | 2 | 3·84 | 13 | 6·91 |
| Total | 9 | 12·84 | 11 | 16·65 | 3 | 5·76 | 23 | 12·22 |

# Cuts of Beef, Mutton and Pork

By W. D. SHEW, G.M.V.C., B.V.Sc., Senior Veterinary Officer

FROM time to time the Department has received requests from stockowners and others for information regarding the best means of cutting up beef, mutton, and pork for table use. In answer to these inquiries the following lists have been prepared, setting out in detail the various cuts made by experienced butchers, with a short description of the most common uses made of these parts by housewives.




Showing the various parts of the ox.
[W. Angliss.

### *Beef Joints*

No. 1. Ox cheek—splendid entrée, can be braised or stewed; requires to be well cooked.

No. 2. Neck—suitable only for beef tea, soups or stews.

No. 3. Chuck—pot roast, free from fat.

No. 4. Back ribs—cheap roasting joint.

No. 5 and 6. Prime ribs—prime roasting joint, may be rolled or supplied with bone.

No. 7. Wing rib—prime roasting joint, free from surplus fat.

No. 8. Middle loin—prime roasting joint.

No. 9. First cut sirloin—prime roasting joint with undercut.

No. 10. Rump—prime steak meat; selvidge fat.

No. 11. Shoulder—tender beef steak for pan or puddings.

No. 12. Bolar—good boiling joint.

No. 13. Brisket—popular corned beef, usually supplied rolled.

No. 14. Brisket—middle cut, corned with bone; streaky fat.

No. 15. Brisket—thin end, corned with bone; streaky fat.

No. 16. Thin flank—corned and rolled; extra quantity of fat.

No. 17. Thick flank and topside—prime beef steak.

No. 18. Silverside—corned round, prime corned joint, free from fat.

No. 19. Shin—suitable for soups and potted meats.

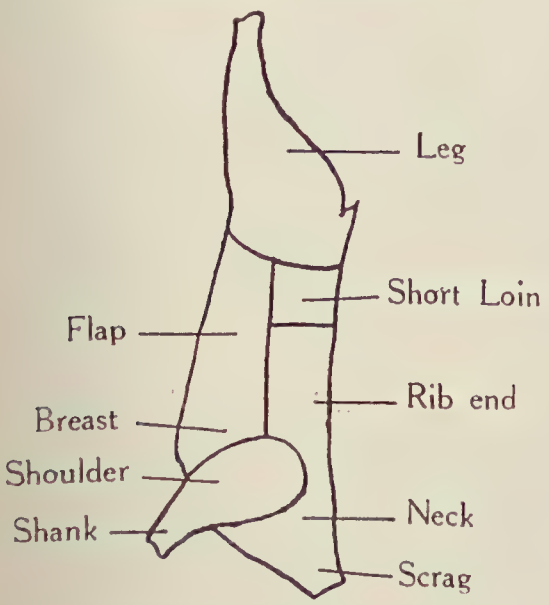
No. 20. Leg—suitable for soups and potted meats.

In addition to the foregoing, there are in the beast several very appetising and useful parts, namely, tripe (the wall of the first and

second stomachs), ox tail, kidney, tongue, and heart, which may be used variously in soups, pies, or stews.

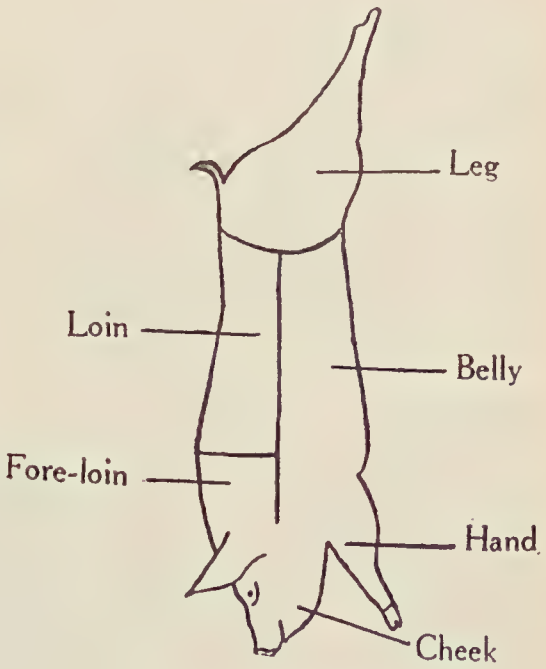
### *Mutton*

Forequarter—used chiefly for roasting and boiling.
Forequarter chops—used chiefly for stewing.
Shank—used chiefly for broth.
Breast—used chiefly for pies and broth.
Best end of neck—used chiefly for roasting or boiling.
Scrag end of neck—used chiefly for stewing.
Hindquarter—
Leg—used chiefly for roasting or boiling.
Loin—used chiefly for roasting.
Rib end—used chiefly for cutlets, grilling, or frying.
Short loin—used chiefly for chops, grilling, or frying.
Flap—used chiefly for stewing.




Showing the parts of the sheep.

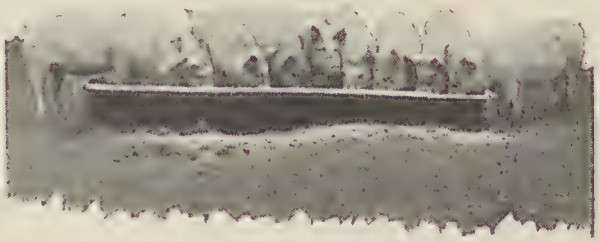
Sheep's head—used chiefly for soups.
Trotters—used chiefly for stewing for invalids.




Showing the parts of the pig.

### *Pork*

Leg—used chiefly for roasting, or boiling, corned or fresh.
Loin—used chiefly for roasting joints, and chops for frying.
Belly—used chiefly for corning and boiling; streaked with fat and lean.
Hand—used chiefly for corning and boiling; lean joint.
Cheek—used for corning, boiling, or making potted meat.
Trotters—excellent for boiling.



# THE BONING OF POULTRY

By M. D. HALL, Assistant Poultry Expert

THOUGH the boning of fowls is rarely practised, it is common enough with turkeys, especially crooked-breasted ones, where the twist in the keel of the breast makes neat carving of the meat very difficult.

After killing and plucking, hang the carcass for at least six hours so as to permit the blood to drain into the neck cavity and solidify. If this is not done the blood may become smeared over the carcass when the bones are being extracted.

The first operation is the drawing of the sinews. This is done by breaking the shank half-way between the foot and the first joint of the leg. Before breaking, cut the skin of the shank, but across the front only; any incision across the back may partly sever the sinews and cause them to break. Extend the lower portion of the shank over the edge of the table, or any other support convenient, and snap the bones. *Do not cut the shank off,* but twist it round a few times in such a way as to cause the bone to protrude through the skin. A piece of rope or wire shaped into a noose and fastened to a post or wall is necessary to draw the sinews. Place the lower part of the shank and foot crosswise in the noose (Fig. 1), and the lower part of the shank will act as a lever. Grasp the leg firmly just above the shank, causing as little pressure as possible on the fleshy part of the leg, and so minimizing the risk of tearing the skin from the flesh then with a downward pull the sinews will come away from the broken shank with the foot.

Chop off the leg immediately above the shank; this will simplify the extraction of the leg bones. It is important for the operator to bear in mind that the bird must not be drawn or disembowelled.

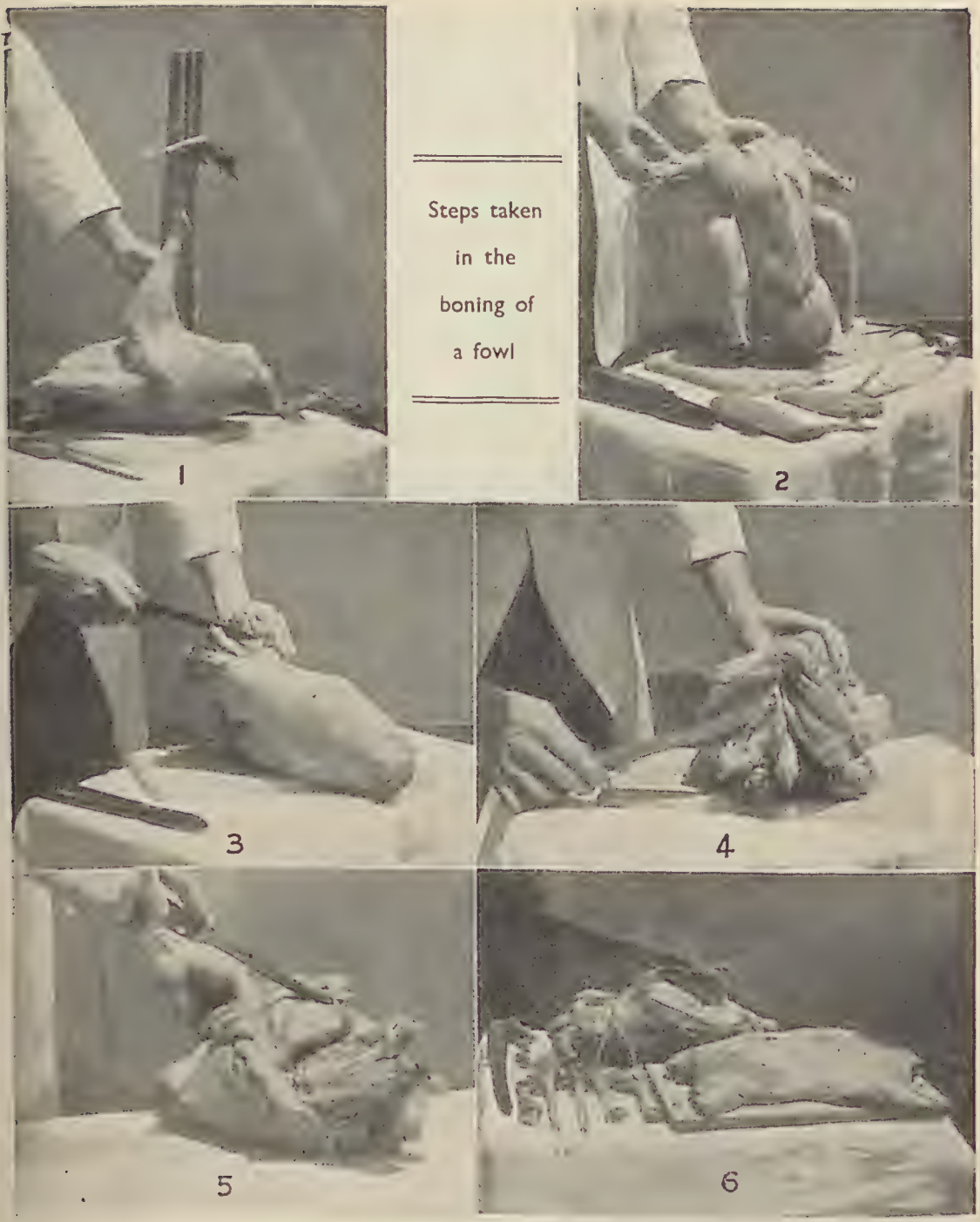
Attention must now be given to the neck. Make a small incision *across* the back of the neck half-way between the head and shoulders, insert the point of the knife and make a long parallel cut towards the shoulder-blades; then turn the bird on its back and cut the skin right across the front of the neck just opposite where the small incision was made in the back of the neck.

Grasp the neck and gullet with one hand and with the other pull the neck-skin over the breast, thus exposing the crop. Disconnect the crop from the skin; cut the gullet off close down to the wish-bone, and cut the neck right off about an inch from the breast, leaving the carcass minus neck and lower portions of legs. Also cut the wings off at the second joint or forearm (Fig. 2). A narrow, keen-pointed knife of medium length is essential to separate the flesh from the bones—one that will work close to the bone without mutilating the flesh to any unnecessary degree.

Next, lay the carcass breast down and carefully insert the knife the whole length of the shoulder-blade, taking care not to puncture the skin. Clear all flesh away from the shoulder-bone, working deep down to the base of the wing or upper arm, and with the point of the knife disjoint the right wing, but be careful not to cut it off (Fig. 3). Then take a firm grip of the wing with the left hand and force the upper arm up in such a manner as to expose the knuckle. Clear all flesh from the bone down to the forearm, and the bone will come away. Then deal in the same way with the other wing.

Turn the carcass on the back and with the point of the knife outline the wish-bone and it may be easily withdrawn (Fig. 4). With the wish-bone removed, move the knife carefully towards the breast-bone and up and along the keel until it is possible to force the leg forward and the leg-joint is exposed. This joint protrudes from under the breast-meat which has been cut away and appears inside out. Disjoint, *but do not cut off* (Fig. 5). Clean the flesh away from the knuckle and along the thigh-bone to its base; disjoint and it will come away. Cut all flesh from the other bone commencing at the knuckle, and it too will come away. Then treat the other leg in the same way.

With both legs boned all that remains to be done is to trace the bone structure along both back and front towards the tail. By forcing the flesh away from the bones, the fillet turns inside out. After leaving the point of the breast-bone the operator must be careful not to interfere with the bowels, which have no




Steps taken in the boning of a fowl

protection other than a layer of fat and membrane. By working along both back and front, the bony structure of the carcass can be got away completely. Some people favour leaving on the tail, but in the writer's opinion it also is a bony substance, and therefore should be removed. Fig. 6 illustrates a completely boned carcass.

# Cutting the Wings of Fowls

By H. F. Clinton,
Poultry Expert.

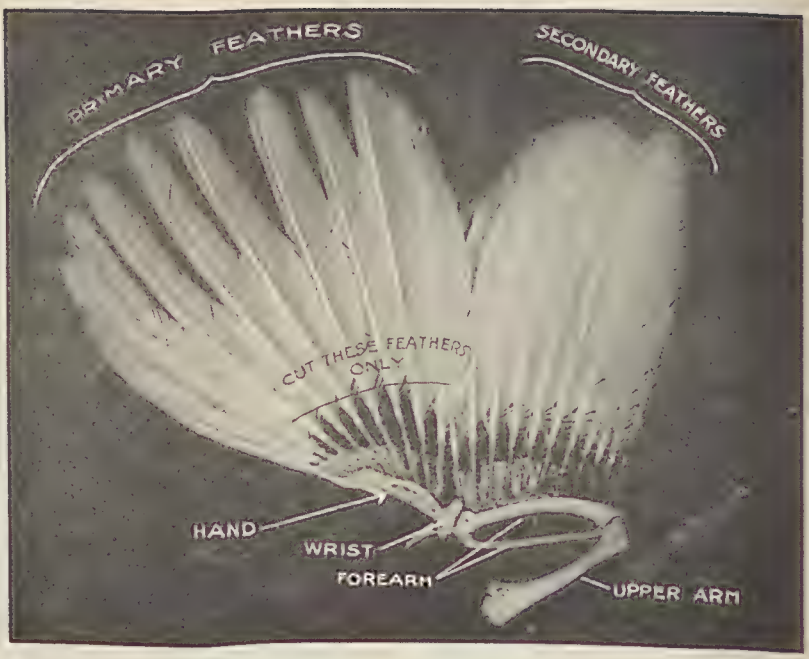



Fig. 1.—The skeleton of a fowl's wing.

THE domestic fowl, which has developed along the lines of a flying rather than a running bird, does not possess any notable capacity for flight. It can, however, pass over an ordinary fence without very much difficulty. Occasionally, therefore, it becomes necessary to cut the wings of fowls, and the following directions for performing this operation are set out in the hope that they will be helpful, not only to competitors in the Burnley Egg-laying Competition, but also to the suburban and small poultry-keepers who are anxious to keep their birds within well-defined spaces and at the same time take some pride in the appearance and health of their stock.

Fig. 2.—The correct method of cutting the wing of a fowl.

Although it is not the practice on commercial poultry farms to cut the wings of fowls, one of the requirements of the Burnley Competition, before the elimination of the teams section of the contest was that all birds entered in this test (section A) must have their left wings cut before they were forwarded to Burnley. This was necessary to prevent fowls in this particular section passing from one pen to another. The single test pens are enclosed completely, and birds entered in that class are not required to have their wings cut.

## *The Correct Method.*

The fore-limb of a bird, which is modified for the purpose of flight, is commonly termed the wing. The skeleton which is illustrated in Figure 1 shows the various component parts clearly. The bone attached to the body is the upper arm, to which is attached the forearm, consisting of two bones. Connected with the two small bones of the wrist is the hand with its rudimentary fingers. The long quill feathers of the wing of an

Fig. 3.—A correctly cut wing will close neatly over the body and protect it.

adult hen are divided into primaries and secondaries. The longest or primary feathers are attached to the hand or end segment of the wing, while the secondaries are joined to the forearm.

In cutting the wing of a fowl, it must be remembered that the primary feathers only, of the left wing, are dealt with. All of these except the first three are removed, giving the appearance illustrated in Figure 2. If this is done correctly, the wing will close nicely over the body (Figure 3). It is found frequently that poultry-keepers remove either the whole of the wing, i.e., the primaries and secondaries, or else the whole of the wing except the first three primary quills. Either practice is quite unnecessary to prevent flight, and in addition gives a most unsightly appearance to the bird (see Fig. 4). Further, a badly cut wing exposes the body to all weather conditions, which in turn may lead to the development of pneumonia or roup, usually with fatal results. This factor is of the utmost importance to poultry keepers as at certain times of the year the weather is very showery and changeable and the birds, which are liable to become wet and chilled, require all the protection possible.

Fig. 4.—A badly cut wing is unsightly and affords the bird little protection from adverse weather conditions.

# Lice on Poultry

Lice, of which there are various kinds on fowls, cause itching and irritation which bring about general restlessness and interfere with growth, development and egg production.

Good results in eradication can be obtained by the use of commercial sodium fluoride. Hold the bird on a table and apply a pinch next to the skin under the feathers, a pinch under the head, one on the neck, two on the back, one on the breast, one pinch below the vent and on the tail, and one on each thigh and on the underside of each wing.

An easier but not such an effective method can be used by mixing three parts of flour with one part of sodium fluoride, and dusting the bird thoroughly with a powder blower.

Another method of eradication is to choose a calm night and apply a fine trickle of nicotine sulphate 40 per cent. along the centre of the perches before the birds go to roost. A very small amount of this material must be used, however. The warmth of the birds causes the fumes to rise and penetrate the feathers. As the eggs are not destroyed by the fumes, this treatment should be repeated once a week for three weeks to kill all the lice as they hatch out.

Dust baths containing some tobacco dust or insect powders may be used also, but are not so effective as the individual treatment of the lice-infested birds.

[Contributed by the Live Stock Division.]

# IN THE ORCHARD

Compiled by G. W. GAYFORD, B.Agr.Sc., Horticultural Instructor

### *Setting Out a Block of Fruit Trees*

ASSUMING that all operations prior to planting have been carried out, i.e., ploughing, drainage, grading and fencing, the block should be ready for setting out during the winter months. For deciduous trees planting may be done any time during the dormant period of the trees, i.e. June to August inclusive. Citrus trees are best planted in September so that they commence growth immediately after planting.

*Distance between trees.*—The distance between the trees varies considerably with the kind of tree and the locality. For deciduous trees under excellent soil conditions 24 feet between trees should be allowed. This distance should also be provided between citrus trees in northern districts. For deciduous trees under average soil conditions 18 to 20 feet spacing should be sufficient. Walnuts should not be planted less than 40 feet apart. The number of trees per acre for various planting distances are shown in the following table:—

| *Distance between trees* Feet. | *Number of trees* per Acre. |
|---|---|
| 18 .. .. | 134 |
| 20 .. .. | 108 |
| 22 .. .. | 90 |
| 24 .. .. | 76 |
| 30 .. .. | 48 |
| 40 .. .. | 27 |

*Setting out the area.* — For most purposes the square system of planting has proved convenient and popular for orchard work. Trees set out this way can be easily cultivated, sprayed and irrigated. For steep slopes or light soils on medium slopes, however, the contour method is definitely the most suitable because it is possible to control the flow of excess surface water, thus reducing erosion, and retain more water from the useful summer rains. This method of planting is gaining much favour overseas and in other parts of the Commonwealth. Any grower desiring information or assistance in this method of planting should communicate with the Horticultural Division, Department of Agriculture, Melbourne, C.2.

For the purposes of these notes, however, the commoner square system is described. Equipment necessary is very simple and is readily available. The chief articles required are an accurate measuring tape, two lengths of No. 8 or 10 gauge fencing wire, one length being about 200 feet long, the other about 110 feet, and about 120 stakes (18in. x 1 in. x 1½ in.).

The most important task is to set out the position of the first row of trees, as this is the base line from which the rest of the block is measured. The first row is usually planted out parallel to some permanent feature, such as a fence, road, or head ditch. It is necessary to allow adequate room on this headland for the passage and turning of tractors and implements. A distance of 20 feet would be the minimum for this purpose.

In this instance, it is assumed that a block of 100 trees is to be planted out with the trees

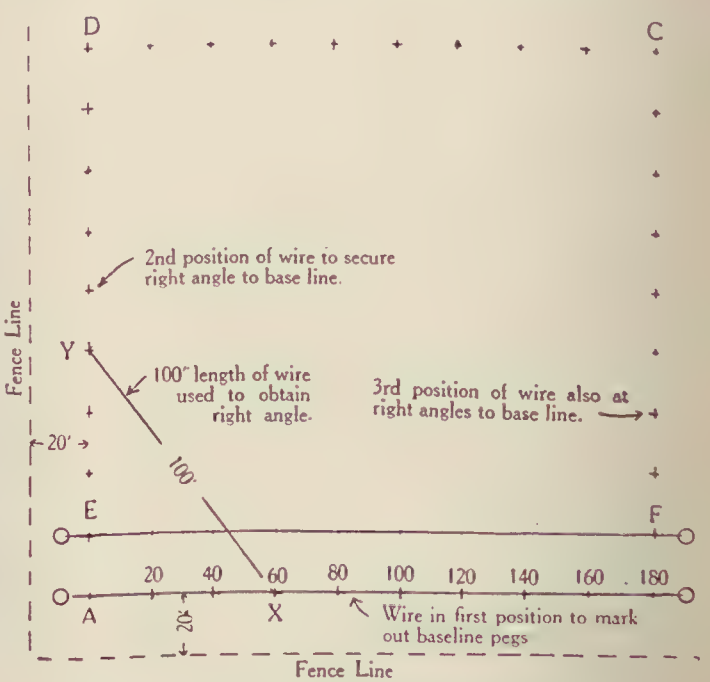



Fig. 1. Method of setting out an orchard block.

Fig. 2. Planting trees direct without using a planting board.

20 feet apart each way. (Fig. I.). Place pegs in the ground at each end of the proposed block 20 feet from the fence.

The greater length of fencing wire should previously be prepared for marking out. This is done by firstly attaching to each end an iron ring. Ten feet from one end, a mark is made on the wire and the rest of the length is then marked at 10 twenty-foot intervals, allowing a further 10 feet distance between the last mark and the other end of the wire. The marks on the wire are best made by soldering a small piece of wire or tin at each point. The marking wire is then stretched between the two pegs on the headland so that the first mark on the wire is a distance of 20 feet from both fences, assuming that there is a fence running at right angles to the one from which the base line was measured. The wire should be held taut in position by driving iron stakes through the rings. Stakes are put in the ground at the marks on the wire, making sure that the stakes are in the same position in relation to each mark. This will form the base line for the block. (A.B. in Fig. I.).

Next a right angle to the base line must be obtained and the following method is suggested:—

The shorter piece of wire is marked out in a length of 100 feet, the first mark being placed on the peg X which is 60 feet from A. Stretch the wire tight in the direction of Y. The longer wire is swung around towards D with the first mark still on the peg A. Move the two wires so that when both are quite taut, the 80 foot mark on the long wire coincides with the 100 foot mark on the short wire at Y. The long wire should then be firmly staked in position and pegs can then be placed in position along the line AD. Similarly, the line BC may be marked out.

With the base line and two side lines in position, the setting out of the remainder of the pegs is a comparatively simple matter. Stretch the wire between pegs E and F and insert stakes according to the marks on the wire. The procedure is continued until the whole block is pegged out.

A considerable saving in time and stakes may be made by planting the trees directly according to the marks on the wire. If this course is decided upon it would be advisable to first set out the base and side lines with pegs, and replace these with trees as a final operation.

Where stakes are used to mark the site of the tree, it is necessary to use a planting board to ensure that the tree occupies exactly the same position as the stake. The board consists of a piece of wood 2 ft. 6 in. to 3 feet long and about 6 inches wide. A notch is cut in the centre and two holes at each end. Two loose-fitting pegs are inserted in the holes. The board is put on the ground with the marking stake fitting into the notch and the two pegs are driven into the soil through the holes. The board and stake are removed but the pegs are left in the ground. A hole is dug to accommodate the roots of the tree and the board is replaced over the pegs. The tree is then held in position in the notch (Fig. 2) so that it occupies the same position as the stake while the earth is being replaced. Trees should be planted at the same depth as that at which they were growing in the nursery.

Fig. 3. The planting board with tree in position.

*Preparation of trees for planting.*—The tops and roots of nursery trees should be cut back before planting. If the tree is a yearling or "whipstick" it should be cut back to within 15 to 18 inches of the roots. If a second year tree, the branches should be cut back to within 4 or 5 inches of their point of origin on the main stem. Main roots should be cut back to within 6 inches of the stem and most of the fibre should be removed. Cut out any split or damaged roots or roots which are much more vigorous than the remainder as these would result in an unbalanced root system. After planting, if it has not been possible to rabbit proof the area, young trees should be protected by tying strips of hessian, &c. around the stems.

# THE FLOWER GARDEN

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley Gardens.

## *Lily of the Valley*

CROWNS of Lily of the Valley (*Convallaria majalis*) may be planted this month. The pure white and very pale pink fragrant, small, bell-shaped flowers of this plant are popular favourites.

They grow best in a well-drained, rich sandy loam, containing leaf mould or well-rotted manure. Sometimes the small crowns do not flower the first year, but the larger ones should flower in the spring after planting.

The Lily of the Valley requires partial shade, it can be planted under deciduous trees or on the east or south side of evergreen trees or on the sheltered side of walls or fences. If the soil is moist better growth will be obtained. Space the plants at least 4 inches apart and cover the crowns with a mixture of sandy loam and leaf mould or well-rotted compost to a depth of 2 inches. Subsequent cultural treatment consists of top dressing the bed in autumn with well-rotted stable manure, and the removal of the old leaves during April or May.

The beds of Lily of the Valley should be left undisturbed for three or four years, or until the plants become very crowded and the flower spikes become less numerous. When this occurs plants should be lifted, divided and replanted in a fresh position.

It is particularly important when picking flowers of Lily of the Valley to pick them without removing the leaves. The removal of the leaves starves the crown and flowering will be less on this account. If leaves are required, endeavour to take only one from each plant. Each crown has only a few leaves, from two to four as a rule, and if one is taken from the stronger plants not much harm will be done to the crown.

There are several varieties of Lily of the Valley in cultivation, but stocks of these are difficult to obtain at the present time. One of the large flowered varieties is *Fortin's Giant Flowered,* and others are *Victoria prolificans,* which has large white flowers flushed with pink, and *rosea* which is also a pink tinted variety. In addition to these there is a double form which is not considered to be of such high quality as the large single-flowered forms.

## *Gladioli and Dahlias*

Gladiolus corms and dahlia tubers should be lifted annually. The best time to lift gladiolus is about six weeks after flowering, when the foliage commences to lose its green colour. If lifted at this time, the small cormlets attached to the larger corms will not be easily separated from the parent corm and hence will not become weeds in the garden. After lifting, the tops should be cut off about 6 inches above the corms and the corms spread in a thin layer to dry. When dry, they should be cleaned and stored in a cool, airy space. A dusting of naphthalene flakes will deter insect pests which sometimes attack the stored corms. Do not forget to inspect the corms from time to time to see whether they are dry enough and free from insect pests.

Towards the end of the month dahlia clumps should be lifted. The usual practice is to cut back the dahlia top to within 1 foot of the ground and then leave it for several weeks before lifting. If any water accumulates in the cut stems, turn the clump upside down after

lifting in order to drain this out of the plant, otherwise this water may cause rot to set in. When lifting the clumps care should be taken not to damage the tubers and a good plan is to leave some soil around the necks of the tubers. Store the tubers in a fairly dry place away from frost. Convenient places for storage are under evergreen trees, particularly conifers, or under an evergreen hedge. If stored in sheds, they should be inspected from time to time to see that they do not become too dry and commence to shrivel.

### *Blue Water Lily*

Many gardeners are anxious to grow a Blue Water Lily. This is a native of tropical and subtropical climates, and difficulty will be experienced in growing it in Victoria unless its cultural requirements are known.

The crowns of this Blue Water Lily (*Nymphaea stellata*) may be planted in a mixture of clayey soil and well-rotted cow manure in 12-inch pots or tubs, and should have at least 8 or 9 inches of water above the surface of the soil; 1 foot or 15 inches of water is better. They are usually planted in October after frosts have finished.

At this time of the year the pots should be lifted out of the water and placed in a warm position during the winter, and certainly be protected from frost.

This plant is more tender than the majority of the other types of Water Lilies which are commonly grown in Victoria, and failure to realize this fact often leads to the loss of the crowns during the winter.

## *THE VEGETABLE GARDEN*

### *Kale*

This leafy crop is becoming more popular, and the large green curly leaves are a very good source of greens. It is sometimes known as Borecole, and one of the popular varieties is *Curly Scotch Kale*. Plants may be transplanted this month. The preparation of the bed should be similar to that for cabbages and cauliflowers; it is a member of this family, and requires rich soil with plenty of organic matter. Blood and bone or market garden manure added at the rate of 3 or 4 oz. to the square yard will be found beneficial. Set the plants about 2 feet in the rows and space the rows 2 feet to 2 feet 6 inches apart.

### *Lettuce*

Plants of *Imperial D, New York,* and *Webb's Wonderful* lettuce may be set out this month in warm situations and in well prepared beds. Space the plants about 12 inches apart with 12 to 18 inches between the rows. After they are established a watering with nitrate of soda, 1 oz. in 1 gallon, will assist their growth during the cold weather.

### *Onions*

Early white onions may still be planted out this month; *Silverskin, Early Barletta,* and *Australian White Queen* are suitable varieties, and in addition *Early Brown Globe* and *Odourless* can also be planted.

Space the plants about 4 inches apart in rows 10 or 12 inches apart. Seed of the later varieties, *Victorian Brown* and *Brown Spanish,* may be sown in seed beds or drills this month, covering the seed with about ½ inch of fine sandy soil.

### *Leeks*

Sow seed of *Musselburgh* or *London Flag* varieties this month in seed bed or drill rows, and cover with ½ inch of fine sandy soil.

### *Carrots and Parsnips*

Well-grown carrots and parsnips may be stored in damp soil or sand for the winter months. If the beds in which they were grown are well drained and do not become too wet during the winter, they may be left where they grew, but generally it is better to lift them and store them in damp sand.

### *Preparation of Beds for Spring Planting*

Dig over empty beds in the garden and incorporate in them well-decayed manure or compost in preparation for spring vegetables.

To beds where it is not intended to plant potatoes or tomatoes, apply lime or wood ashes to the surface, which should be left rough, at the rate of about 6 oz. to the square yard.

# APPROVED SEED POTATOES

## LIST OF GROWERS, 1945

By G. H. MATTINGLEY, Potato Expert.

IN order to meet the demand for good quality "seed" potatoes brought about by war-time expansion of acreage and the increasing desire on the part of many farmers to plant only the best seed obtainable, the Department of Agriculture now carries out extensive inspections of potato crops each season.

Crops of the main commercial varieties located in recognized seed-growing areas are inspected in the field during the flowering period, and their value as seed is assessed according to the percentage of diseased and foreign plants present. Those crops which show no more than 8 per cent. diseased plants and/or 2 per cent. "strangers" are considered as suitable for seed purposes and are listed hereunder as "approved seed".

The standard set for approved seed this year represents an improvement on that operating last season. It is a reasonable conjecture that in future years only crops grown from certified stock will be accepted for approved seed purposes.

It should be stressed that "approved" seed is not to be confused with "certified" seed. The latter, which conforms to a much higher standard of purity and freedom from disease, is only marketed in sealed bags carrying the official certification label of the Department of Agriculture. Approved seed is packed in bags branded "A. seed," which carry no other distinguishing features.

Sales of approved seed potatoes may be made by direct negotiation between grower and buyer, subject to permit issued by the Deputy Potato Controller, 370 Little Collins-street, Melbourne, or any Potato Inspector.

### CENTRAL HIGHLANDS

| Name and Address of Grower. | Acreage. | Tonnage Approved. |
|---|---|---|
| **VARIETY—LATE CARMAN.** | | |
| Adams, E. G., Newham | 10 | 20 |
| Anderson, A. K. and A. J., East-street, Daylesford | 21 | 60 |
| Anderson and Sullivan, Murphy-street, Romsey | 13 | 25 |
| Balharrie, A. S., Italian Hill, Daylesford | 20 | 60 |
| Balharrie, H. A., Musk | 14 | 40 |
| Barbour, C. M., Rochford, via Woodend | 18 | 35 |
| Binks Bros., Colbrook, via Ballan | 10 | 30 |
| Botheras and Son, Bullarto | 20 | 50 |
| Boustead, A. C., Dean | 30 | 80 |
| Britt, C., Dunnstown | 6 | 20 |
| Britt, T. P., Dunnstown | 9 | 25 |
| Brown, P., Bullarto | 18 | 40 |
| Bull, E. A., Musk | 30 | 60 |
| Bull, Geo., Musk | 65 | 150 |
| Carbury, N. T., Navigator | 7 | 20 |
| Chapman, W. W., Gordon | 30 | 90 |
| Clarke, P., Dean | 10 | 25 |
| Coghlan, Jas., Bullarto South | 4 | 10 |
| Cook, L. J., Romsey | 31 | 60 |
| Courtney, M. E., Daylesford | 24 | 50 |
| Crozier, G. S., Newham | 20 | 50 |
| Dalziel, J. C., Clarke's Hill | 10 | 30 |
| Donegan, J. J. and P. J., and Carey, C. J., Wallace | 19 | 55 |
| Donegan, J. P., Wallace | 10 | 30 |
| Downey, J. E., Wallace | 9½ | 25 |
| Downey and Shearer, Wallace | 8 | 20 |
| Dwyer, J., Bullarto South | 12 | 25 |
| D'Arcy, L. F., Greendale | 4 | 12 |
| D'Arcy, P. B., Greendale | 4 | 12 |
| Else, Arnold, Hesket, via Woodend | 17 | 35 |
| Else, J. F., Romsey | 10 | 20 |
| Flynn, J., Dunnstown | 7 | 20 |
| Flynn, L., Dunnstown | 12 | 35 |
| Frith, J. J., Bullarto | 38 | 100 |
| Frost Bros., Kerrie, via Romsey | 20 | 40 |
| Glenane and Ryan, Dunnstown | 15 | 45 |
| Greene, S., Warrenheip | 9 | 25 |
| Hayden, J. J., Wallace | 5 | 15 |
| Howard, W. H., Scotsburn | 10 | 25 |
| Jenner, A. R., Box 9, Trentham | 5½ | 10 |
| Judson, T. J., Lyman-street, Daylesford | 16 | 45 |
| Kirby, A., Coomoora | 27 | 60 |
| Labbett Bros., Clarke's Hill | 16 | 45 |
| Leggo, E. G. and J. R., Italian Hill, Daylesford | 30 | 75 |
| Leonard and Forbes, Millbrook | 45 | 100 |
| Linehan, P., Lancefield | 38 | 80 |
| Liversidge, R., Leonard's Hill | 10 | 30 |
| McCarthy, C., Rocklyn | 16 | 45 |
| McCarthy, J. L., Lancefield | 14 | 30 |
| McColl, A., Miner's Rest | 10 | 30 |
| McKay, G. A., Dean | 19 | 50 |
| McKay, R. C., Newlyn | 18 | 45 |
| Madigan and King, Bungaree | 16 | 100 |
| Mahar, M. F., Warrenheip | 46 | 90 |
| Mossop, E. M. and C. W., Bullarto | 10 | 30 |
| Murphy, A. P., Dunnstown | 14 | 40 |
| Myers, T., Dean | 13 | 40 |
| Orr, F. S., Bullarto South | 39 | 80 |
| Orr, W. C., Bullarto South | 30 | 60 |
| Pardon, T., Glenlyon | 24 | 50 |
| Pearce, C. R., Bullarto South | 9 | 30 |
| Pearce, Geo., Bullarto | 14 | 30 |
| Quirk, Jno., Navigator | 2 | 6 |
| Ralston Bros., Pootilla | 16 | 40 |
| Riley Bros., Bullarook | 26 | 75 |
| Rodda, W., Musk | 12 | 30 |
| Rothe, F., Little Hampton | 4 | 15 |
| Rumler, J. C. and Sons, Glenpark | 6 | 15 |
| Scott, Lorensene and Sons, Scotsburn | 34 | 75 |
| Shearer, A. W., Wallace | 7 | 15 |
| Shearer, A. W. and Carroll, R., Wallace | 8 | 15 |
| Shearer, Jas., J. and P. Bolwarrah | 24 | 45 |
| Shearer, Norman, Bungaree | 15 | 45 |

## CENTRAL HIGHLANDS—*continued*

| Name and Address of Grower. | Acreage. | Tonnage Approved. |
|---|---|---|
| **VARIETY—LATE CARMAN.** | | |
| Shillito, F. W., Yendon | 10 | 30 |
| Spring Bros., Romsey | 4 | 10 |
| Spurling, W., Trentham | 23 | 50 |
| Suckling, T., Clarke's Hill | 18 | 50 |
| Tait, E. M., Dean | 15 | 45 |
| Thomson, W. and L. S., North Monegeetta | 8 | 15 |
| Thorneycroft, W. J., Main-street, Romsey | 10 | 20 |
| Tinney, A. R., Bungaree | 15 | 40 |
| Trewhella, C. A., Trentham | 12 | 30 |
| Trigg, Harry and Son, Bungaree | 20 | 50 |
| Walsh, D., Gordon | 30 | 80 |
| Walsh, J. M., Warrenheip | 20 | 60 |
| Walsh, J. (Jun.), Trentham | 10 | 30 |
| Walsh, J. (Sen.), Trentham | 5 | 15 |
| White, B. J., Bungaree | 15 | 35 |
| **VARIETY—KATAHDIN.** | | |
| Boustead, A. C., Dean | 2 | 6 |
| Downey, J. E., Wallace | 2½ | 8 |
| Duke, E., Bullarook | 5 | 15 |
| Forbes, S., Bungaree | 8 | 25 |
| Hayden, J. J., Wallace | 4 | 15 |
| Labbett Bros., Bullarook | 3 | 10 |
| Madigan and King, Bungaree | 2 | 6 |
| Orr, J. W., Buninyong | 1 | 3 |
| Ralston Bros., Pootilla | 8 | 25 |
| Scott, Lorensene and Sons, Scotsburn | 30 | 90 |
| Shearer, A. W., Wallace | 4 | 10 |
| Shearer, A. W. and Carroll, R., Wallace | 2 | 5 |
| Shearer, Norman, Bungaree | 7 | 15 |
| Shearer, W., Bungaree | 5 | 10 |
| Shillito, F. W., Yendon | 25 | 75 |
| Tinney, A. R., Bungaree | 4 | 10 |
| Trigg, Harry and Son, Bungaree | 7 | 15 |
| **VARIETY—EARLY CARMAN.** | | |
| Cook, L. J., Romsey | 9 | 20 |
| Crozier, G. S., Newham | 5 | 15 |
| Else, J. F., Romsey | 6 | 10 |
| Newnham, R. H., Newham | 10 | 25 |
| Spring Bros., Romsey | 24 | 50 |
| **VARIETY—UP-TO-DATE.** | | |
| Macklin, T., Mollonghip | 6 | 18 |
| Scott, Lorensene and Sons, Scotsburn | 6 | 15 |
| Toomey, E., Trentham | 14 | 30 |
| **VARIETY—SEBAGO.** | | |
| Britt, T. P., Dunnstown | 1 | 2 |

## WESTERN DISTRICT

| Name and Address of Grower. | Acreage. | Tonnage Approved. |
|---|---|---|
| **VARIETY—LATE CARMAN.** | | |
| Barker, L. G., Weeaproinah | 4 | 16 |
| Baulch, G. R. and R. M., Stalker | 20 | 80 |
| Bichard, A. S., Ferguson | 6 | 24 |
| Birrer Bros., Beech Forest | 7 | 28 |
| Birrer, H. J., Beech Forest | 2 | 8 |
| Brown Bros., Beech Forest | 13 | 52 |
| Burns, Alan, Corunnun | 7 | 28 |
| Burns, Alec, Corunnun | 18 | 72 |
| Cashin Bros., Ferguson | 3½ | 14 |
| Casper, F., Olangolah East | 2 | 8 |
| Close, R. H., Beech Forest | 7 | 28 |
| Copeland, B., Wyelangta | 1½ | 6 |
| Cowan, R. W., Bambra, via Dean's Marsh | 1 | 4 |
| Davies, N. (Mrs.), Beech Forest | 1 | 4 |
| Dow, R. and W., Ferguson | 25 | 100 |
| Farr, N. E., Wimba | 2½ | 10 |
| Fincher, R. L., Beech Forest | 10 | 40 |
| Flanigan, J., Colac West | 27 | 108 |
| Francis, A. E., Ferguson | 5 | 20 |

## WESTERN DISTRICT—*continued*

| Name and Address of Grower. | Acreage. | Tonnage Approved. |
|---|---|---|
| **VARIETY—LATE CARMAN.** | | |
| Garner, K., Coragulac | 7 | 28 |
| Grove, G. A. and F. W., Olangolah East | 3 | 12 |
| Hansen, H. T., Weeaproinah | 10 | 40 |
| Hay, D., Colac | 33 | 132 |
| Holloway, J., Bambra, via Dean's Marsh | 8 | 32 |
| Kealy, M. A., Coragulac | 4½ | 18 |
| Kohring, H., Ferguson | 2½ | 10 |
| Launer, G. F., Beech Forest | 3 | 12 |
| Lee, J. A., Laver's Hill | 3 | 12 |
| McCann, S. M., Ferguson | 6 | 24 |
| McKenzie, N. B., Beech Forest | 3½ | 14 |
| McLachlan, A. D., Bambra, via Dean's Marsh | 3 | 12 |
| Mahoney, J. M. and M., Coragulac | 10 | 40 |
| Mahoney, M. J. and W. J., Coragulac | 10 | 40 |
| Marks, A. E., Gellibrand | 2 | 8 |
| Mazzone, C. and Phillips, Beech Forest | 6 | 24 |
| Middleton, H. J., Nalangil | 12 | 48 |
| Mills, E. R., Colac | 4 | 16 |
| Minchinton, E. A., Weeaproinah | 26 | 104 |
| Minchinton Bros., Ferguson | 3 | 12 |
| Monaco, V. and L., Gellibrand | 3 | 12 |
| Murchison, A. M. J., Ferguson | 23 | 92 |
| Nation, E. A., Weeaproinah | 5 | 20 |
| Norman, Theo, Gravesend-street, Colac | 3 | 12 |
| Parker, S., Ferguson | 5 | 20 |
| Perrett, W. A., Wongarra, via Lorne | 7 | 28 |
| Renzella, V., Wyelangta | 2 | 8 |
| Rolfe, W., Beech Forest | 2½ | 10 |
| Russell, T. J., Cororooke | 8 | 32 |
| Ryan, M., Alvie | 5 | 20 |
| Skinner, F. T., Ferguson | 3 | 12 |
| Smith, I. W., Colac | 3½ | 14 |
| Speirs, A. C. (Jun.), Nalangil | 4 | 16 |
| Tann, W. H., Weeaproinah | 1 | 4 |
| Townsend, J. O. A., Ferguson | 4½ | 18 |
| Towers, A. J., Beech Forest | 2 | 8 |
| Turner, M., Nalangil | 8 | 32 |
| Wilkinson, J., Koroit | 9 | 36 |
| Young, A. E., Beech Forest | 3 | 12 |
| **VARIETY—UP-TO-DATE.** | | |
| Barker, L. G., Weeaproinah | 4½ | 18 |
| Baulch, G. R. and R. M., Stalker | 10 | 40 |
| Beveridge, C. S., Laver's Hill | 4 | 16 |
| Birrer Bros., Beech Forest | 2 | 8 |
| Birrer, H. J., Beech Forest | 7 | 28 |
| Brown, D. B., Wyelangta | 2 | 8 |
| Brown Bros., Wyelangta | 2½ | 10 |
| Burns, Allan, Corunnun | 7 | 28 |
| Burns, Alec, Corunnun | 3 | 12 |
| Butler, J., Weeaproinah | 7 | 28 |
| Cannan Bros., Carlisle River | 1½ | 6 |
| Cartiere, B., Wyelangta | 4 | 16 |
| Cashin Bros., Ferguson | 3 | 12 |
| Caspar, F., Olangolah East | 1½ | 6 |
| Ciancio, M., Wyelangta | 4 | 16 |
| Congram, W. J. P., Beech Forest | 3 | 12 |
| Cowan, R. W., Bambra, via Dean's Marsh | 2 | 8 |
| Crea, W., Hordern Vale | 1 | 4 |
| Fry, J. G., Beech Forest | 7 | 28 |
| Gard, S. M., Ferguson | 4½ | 18 |
| Grove, G. A. and F. W., Olangolah East | 10 | 40 |
| Heffernan, D., Chapple Vale | 4 | 16 |
| Holloway, J., Bambra, via Dean's Marsh | 9 | 60 |
| Hughes, J. (Mrs.), Beech Forest | 1½ | 6 |
| Knox, J. and Son, Weeaproinah | 3½ | 14 |
| Kohring, H., Ferguson | 4 | 16 |
| Larsen, C., Carlisle River | 2½ | 10 |
| Lee, J. A., Laver's Hill | 8 | 32 |
| McKenzie, J. C. and Costin, Apollo Bay | 3 | 12 |
| McKenzie, N. B., Beech Forest | 10 | 40 |
| McLachlan, A. D., Bambra, via Dean's Marsh | 1½ | 6 |
| Marriner, E. and Sons, Hordern Vale | 3 | 12 |
| Mills, E. R., Colac | 7 | 28 |
| Milnes, E. A., Laver's Hill | 2 | 8 |
| Minchinton, F. J., Ferguson | 5 | 20 |
| Murchison, A. M. J., Ferguson | 2 | 8 |
| Rosato, G., Wyelangta | 4 | 16 |
| Russell, T. J., Cororooke | 8 | 32 |
| Ryan, M., Alvie | 2 | 8 |
| Schultz, A., Beech Forest | 2½ | 10 |
| | 3 | 12 |

## WESTERN DISTRICT—*continued*

| Name and Address of Grower. | Acreage. | Tonnage Approved. |
|---|---|---|
| **VARIETY—UP-TO-DATE.** | | |
| Schultz, G. A., Beech Forest | 3 | 12 |
| Simmons, G. J., Wyelangta | 6 | 24 |
| Tann, W. H., Weeaproinah | 5 | 20 |
| Tibbitts Bros., Wyelangta | 10 | 40 |
| Townsend, J. O. A., Ferguson | 2 | 8 |
| Trelfell J. and Kincaid, D., Colac | 20 | 80 |
| Webster, S., Laver's Hill | 6 | 24 |
| Weston, C., Olangolah | 1 | 4 |
| **VARIETY—KATAHDIN.** | | |
| Close, R. H., Beech Forest | ½ | 2 |
| Holloway, J., Bambra, via Dean's Marsh | 3 | 12 |
| Kealy, M. A., Coragulac | 2 | 8 |
| Pitman, L. H., Forrest | 1½ | 6 |
| **VARIETY—SEBAGO.** | | |
| Knox, J. and Son, Weeaproinah | 2 | 8 |
| Kealy, M. A., Coragulac | 1 | 5 |
| **VARIETY—EARLY CARMAN.** | | |
| Grove, G. A. and F. W., Olangolah East | 2 | 8 |

## KINGLAKE DISTRICT

| Name and Address of Grower. | Acreage. | Tonnage Approved. |
|---|---|---|
| **VARIETY—LATE CARMAN.** | | |
| Beach, G., Kinglake East | 10 | 40 |
| Beach, J. W., Dixon's Creek | 8 | 32 |
| Campbell, H. W., Pheasant Creek | 3½ | 14 |
| Carman, J. H., Kinglake West | 12 | 48 |
| Coller and Sons, "Pharamond," Pheasant Creek | 5 | 20 |
| Crough, T., Pheasant Creek | 4 | 16 |
| Dawes, L., Kinglake | 7 | 28 |
| Donlly, M. I. (Mrs.), Kinglake | 7 | 28 |
| Dyball, A. and J., Kinglake | 10 | 40 |
| Dyball, A. and J., and Searle, Kinglake | 5½ | 22 |
| Easdown Bros., Kinglake Central | 5½ | 22 |
| Exton, A., Pheasant Creek | 15 | 60 |
| Exton, A. P., Pheasant Creek | 10 | 40 |
| Galbraith, H., Yea-road, Kinglake West | 13 | 52 |
| Garratt, L., Pheasant Creek | 7½ | 30 |
| Jeffrey, E. E., Toolangi | 10 | 40 |
| Jenkins Bros., Kinglake West | 17½ | 70 |
| Kelly, J. (Jun.), Pheasant Creek | 3 | 12 |
| Kelly, J. (Sen.), Pheasant Creek | 8 | 32 |
| Lawrey, L. K., Kinglake Central | 20 | 80 |
| McMahon, J. P., Kinglake | 8 | 32 |
| Margarson, E., Kinglake West | 3 | 12 |
| Marriott, C. W., Mt. Toole-be-Wong Lodge, Healesville | 30 | 120 |
| Miller, R. G., "Glenlee," Mt. Slide-road, Yarra Glen | 23 | 92 |
| Monk, J. R., Toolangi | 12 | 48 |
| Moore, R., Kinglake | 32 | 128 |
| Nicholls Bros., Kinglake West | 30 | 120 |
| Owen, F. and Son, Pheasant Creek | 34 | 136 |
| Ramsay, G. C., Kinglake | 10 | 40 |
| Reeves, S. A., Kinglake West | 14 | 56 |
| Rotherford, J., Pheasant Creek | 6 | 24 |
| Rowley, R., Pheasant Creek | 4½ | 18 |
| Sargent, S. and H., Pheasant Creek | 4 | 16 |
| Southurst, R. J., Kinglake Central | 15 | 60 |
| Thom, J. R., Kinglake Central | 11 | 44 |
| Thompson, E. M., Kinglake West | 6 | 24 |
| Toohey, D. J., Pheasant Creek | 17 | 68 |
| Toohey, J., Pheasant Creek | 38 | 152 |
| Watson, R. C., Pheasant Creek | 4 | 16 |
| Williamson, T., Yea-road, Kinglake West | 16 | 64 |
| Yarwood, P., Kinglake | 9 | 36 |

## GIPPSLAND

| Name and Address of Grower. | Acreage. | Tonnage Approved. |
|---|---|---|
| **VARIETY—LATE CARMAN.** | | |
| Barnes Bros., Ruby | 6 | 24 |
| Benham, G. P., "Glenthorn," Cora Lynn | 6 | 24 |
| Buckley, J. B., "The Ranch," Buffalo | 25 | 100 |
| Dempsey, F. L., Stony Creek | 14 | 56 |
| Dodd, F., Moe South | 3 | 12 |
| Dunn, G., Brandy Creek-road, Warragul | 18 | 72 |
| Edmondson, J., Moondarra | 4 | 16 |
| *Fraser, J. A., Thorpdale | 7 | 28 |
| Gardam, R. T., Dumbalk | 1 | 4 |
| Jackson, J., Meenlyan | 2½ | 10 |
| Kuhne, F. E., McKinnon Post Office | 10 | 40 |
| Lucas, J. A. T., Moe | 3 | 12 |
| Marks, K., "Waverley," Yarragon P.B. | 3½ | 14 |
| McGrath, J., Moondarra Post Office | 14 | 56 |
| McLeod Bros., Yarram | 2 | 8 |
| Payne, A. (Jun.), Mt. Eccles, via Leongatha | 2 | 8 |
| Payne, A. H., Mt. Eccles South, via Leongatha | 1 | 4 |
| Powell, A. F., Thorpdale | 4 | 16 |
| Rice Bros., Tyres Downs, via Moondarra | 45 | 180 |
| Rich, C., Fish Creek | 3 | 12 |
| Sasse, F. and F. D., "Bracken Heights," Moondarra | 8 | 32 |
| Stewart, J. and Sons, Trafalgar | 10 | 40 |
| Stewart, T., Kernot | 2 | 8 |
| Stewart, J. R., Almurta | 2 | 8 |
| Wheeler, J. W., Sunny Creek-road, Trafalgar | 4 | 16 |
| Wilson, P. C., McKinnon Post Office | 5½ | 22 |

* Denotes Cook's Favourite.

| | | |
|---|---|---|
| **VARIETY—EARLY CARMAN.** | | |
| Auchterlonie Bros., Narracan | 26 | 104 |
| Barrett, J. W., Trafalgar South | 14 | 56 |
| Campbell, H. D., "Argyle," McKinnon's Post Office | 3½ | 14 |
| Connelly, T. J. and McFarlane, W., Koonwarra | 7 | 28 |
| Corrigan, J. L., "Nagirroc," Catani | 1½ | 6 |
| Coulter, R., Mardan | 2½ | 10 |
| Foy Bros., Mirboo North | 4 | 16 |
| Fraser, J. A., Thorpdale | 17 | 68 |
| Gardam, R. T., Dumbalk | 12 | 48 |
| Gunn, H. F., Thorpdale | 2½ | 10 |
| Gunn, Norm, Thorpdale | 3 | 12 |
| Heal Bros., Thorpdale | 5 | 20 |
| Higgs, H., Warragul | 4 | 16 |
| Ingleton, R., "Blackwood Park," Narracan | 5 | 20 |
| Matthies, Roy T., McKinnon's Post Office | 6 | 24 |
| Mayo, L. C., Thorpdale | 12 | 48 |
| McCann Bros., Trafalgar | 4 | 16 |
| McIndoe, J. A., Leongatha | 10 | 40 |
| McCrae, E. and J., Narracan East | 11½ | 46 |
| O'Hehir, M., Garfield | 5 | 20 |
| Powell, A. F., Thorpdale | 6 | 24 |
| Pyle, H. A., Mardan | 4 | 16 |
| Shackleton, H., Thorpdale | 4 | 16 |
| Stewart, G. C., Yarragon | 6 | 24 |
| Williams, G. L., Thorpdale | 12 | 48 |
| **VARIETY—KATAHDIN.** | | |
| Anderson, S., Mt. Eccles L.B., via Leongatha | 1 | 4 |
| Campbell, H. D., "Argyle," McKinnon's Post Office | 1 | 4 |
| Gorey, M. J., Vesper, via Noojee | 8 | 32 |
| Maddison, H. E., Stony Creek | 2 | 8 |
| Mayo, L. C., Thorpdale | 2 | 8 |
| Pyle, H. A., Mardan | 1 | 4 |
| Shackleton, H., Thorpdale | 2 | 8 |
| **VARIETY—UP-TO-DATE.** | | |
| Arnup Bros., O'Grady's Ridge-road, via Foster | 7 | 28 |
| Gilbert, H. T. and Sons, Amey's Track, via Foster | 4 | 16 |
| Hellison, M. A., Fish Creek | 3 | 12 |
| Hiscock, A., Foster North | 18 | 72 |
| McCann Bros., Trafalgar | 6 | 24 |
| Standfield, H. and S., North-road, Fish Creek | 1½ | 6 |
| Wheeler, J. W., Sunny Creek-road, Trafalgar | 6 | 24 |

## DANDENONG RANGES

| Name and Address of Grower. | Acreage. | Tonnage Approved. |
|---|---|---|
| **VARIETY—LATE CARMAN.** | | |
| Beazley, H. G., Emerald | 5 | 20 |
| Birrell, S. H., Cockatoo | 8 | 40 |
| Boys, A., Cockatoo | 2 | 10 |
| Cromb, A. E., Millgrove | 8 | 30 |
| Ferres, H. McD., Emerald | 4 | 16 |
| Gallenti, D., Emerald | 12 | 50 |
| Harris, Jas., Cockatoo | 5 | 20 |
| Havis, G. J., Avonsleigh | 2 | 8 |
| Johns, E., "Glenpark," Selby | 12 | 50 |
| Johns, P. S., Selby | 18 | 70 |
| Johns, W. D., "Hillandale," Selby | 3 | 12 |
| Jordan, A., Kallista | 2 | 10 |
| Lamendola, J., Emerald | 15 | 60 |
| McBeth, J., Carnegie | 11 | 44 |

## DANDENONG RANGES—*continued*

| Name and Address of Grower. | Acreage | Tonnage Approved. |
|---|---|---|
| **VARIETY—EARLY CARMAN.** | | |
| Cromb, A. E., Millgrove | 5 | 20 |
| Johns, P. S., Selby | 3 | 12 |
| McBeth, J., Carnegie | 5 | 20 |
| **VARIETY—UP-TO-DATE.** | | |
| Beazley, H. G., Emerald | 4 | 15 |
| McBeth, J., Carnegie | 2 | 10 |
| **VARIETY—KATAHDIN.** | | |
| Johns, W. D., Selby | 6 | 25 |
| **VARIETY—SEBAGO.** | | |
| McBeth, J., Carnegie | 8 | 25 |

# Tubercle-free Herds

### ACCREDITED TUBERCLE-FREE HERDS.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

| Name. | Address. | Number in Herd. |
|---|---|---|
| Aboriginal Station | Lake Tyers | 109 |
| Armstrong and Son | Wangaratta | 105 |
| Ballarat Orphanage | Ballarat | 129 |
| Banyule Stud Pty. Ltd. | Wangaratta | 54 |
| Beggs, A. R. | Beaufort | 70 |
| Black, I. S., Estate | Mount Noorat | 60 |
| Clark, W. J. | Monomeith | 130 |
| Cribbes, T. | Wangaratta | 39 |
| Deering, J. T. | South Wangaratta | 61 |
| Dennis, Mrs. A. A. | Frankston | 23 |
| Dookie Agricultural College | Dookie | 85 |
| Foletta G. G. and Son | Buxton | 109 |
| Geelong Grammar School | Corio | 78 |
| Gorman, A. W. | "Cathcart," Alexandra | 57 |
| Griffin, G. W. | Gladysdale | 50 |
| Griffiths, J. G. | Benalla | 121 |
| Howlett, Mrs. G., and Miss E. Samuel | Lang Lang | 55 |
| Jakobi, L. W. | "Granada," Yannathan | 89 |
| Johnson, F. G. | Horsham | 11 |
| Kane, F. E. | Warrnambool | 28 |
| Kilmany Park Farm Home for Boys | Sale | 105 |
| Lady Talbot Milk Supply Co. | Cranbourne | 489 |
| Lawrence, P. H. | "Rainga," Tarrawarra | 83 |

| Name. | Address. | Number in Herd |
|---|---|---|
| Longerenong Agricultural College | Dooen | 48 |
| Maloney, P. J. | Tongala | 66 |
| Murray, M. G. | Lima | 26 |
| McNabb and Son, G. A. | Irrewillipe East | 159 |
| Nancarrow Bros. | Kerang | 47 |
| Noonan, G. | Benalla | 31 |
| Noonan, Mrs. S. A. | Benalla | 35 |
| Northcote Children's Farm | Bacchus Marsh | 165 |
| Onley, W. H. | "Glenholme," Caldermeade | 67 |
| Parker, Mrs. L. M. | Tallarook | 67 |
| Payne, A. E. T. | "Yarra View," Lilydale | 66 |
| Payne, C. E. N. | "Woodburn," Kilmore | 44 |
| Poole, M. A., and D. | Caldermeade | 120 |
| Poole, M. A., and D. | Yannathan | 104 |
| Powell, T. S. | "Carellen," Mansfield | 43 |
| Richardson Bros., Messrs. | "Faldinghurst," Upper Beaconsfield | 53 |
| Roe, Thomas H. P. | Cobram | 27 |
| School of Horticulture | Burnley | 6 |
| State Experiment Farm | Rutherglen | 37 |
| State Research Farm | Werribee | 245 |
| Stephens, Dr. F. | Vermont | 32 |
| Vagg, T. R. | Officedale | 45 |
| Wells, W. G. | Caldermeade | 65 |
| Woodyer, P. A. | Mornington | 19 |

In addition to the above-mentioned herds there are 848 commercial dairy herds containing 22,158 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they can not be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 321 herds in which 11,219 head of cattle have passed one test, and may be considered, therefore, to be in process of becoming tubercle free herds.

# Licensed Skin Buyers

## Sheep Owners' Protection Act

The following is a list of persons licensed under the Sheep Owners' Protection Act, to buy raw sheep skins. The licences have effect until the 31st December, 1945 :—

| Licence No. | Holder of Licence. | Address. |
|---|---|---|
| 1938 | Allan, J. R. .. | 19 King-st., Melbourne |
| 1978 | Allwood, W. H. .. | High-st., Rutherglen |
| 1945 | Angliss, W. and Co. Pty. Ltd. | 42 Bourke-st., Melbourne |
| 2063 | Austin and Ford Pty. Ltd. | Hopetoun |
| 2059 | Australian Central Woolgrowers and Realization | 590 Little Bourke-st., Melbourne |
| 1987 | Banks, C. L. .. | Barkly-st., Ararat |
| 2033 | Banks, R. P. .. | Dunolly |
| 2002 | Barrett, H. L. .. | 12 Bond-st., Sale |
| 2044 | Bartlett, A. E. .. | High and Warren sts., Echuca |
| 2038 | Bennett, S. C. .. | 71 Isabella-st., Geelong West |
| 2013 | Berman, D. .. | 395 St. Kilda-st., Elwood |
| 1943 | Biggs, H. A. and Son | Korumburra |
| 2046 | Birchall, Thos. .. | 20 Abbott-st., Sandringham |
| 2078 | Black, S. B. P. .. | 190 Albert-st., Ballarat |
| 2051 | Borthwick, Thos. and Sons (A/asia.) Ltd. | 84 William-st., Melbourne |
| 2020 | Bourke, D... .. | 89 Cox-st., Hamilton |
| 1935 | Brabender, L. C. .. | Maryborough |
| 1965 | Brooks, Mrs. E. J. .. | Guthrie-st., Quambatook |
| 2071 | Brown, C. .. .. | Stanhope-rd., Rushworth |
| 2058 | Bunn, W. G. .. | South-rd., Warragul |
| 1961 | Burns and McCleave | 206 Mair-st., Ballarat |
| 2018 | Burrows, A. D. .. | 27 Scoresby-st., Kerang |
| 2017 | Burrows, G. A. .. | 34 Boundary-st., Kerang |
| 2086 | Burton Stores Pty. Ltd. | Euroa |
| 1970 | Butler, E. and Sons.. | Tallangatta |
| 2081 | Byerley, H. M. .. | 115 Wright-st., Adelaide, S.A. |
| 1949 | Callan, P. J. .. | 6–8 Moorabool-st., Geelong |
| 1956 | Canfield, E. F. .. | Gillies-st., Rochester |
| 1994 | Carlile, T. H. .. | Watson-ter., Mt. Gambier, S.A. |
| 2065 | Cary, W. A. .. | High-st., Heathcote |
| 2016 | Cass, R. .. .. | Chetwynd |
| 1955 | Claffey, A. S. .. | Taverner-st., Rainbow |
| 2010 | Collins, H. G. .. | Commercial-st., Kaniva |
| 1975 | Cook, T. J. .. | Black-st., Terang |
| 1941 | Cook, W. J. .. | Allansford |
| 2031 | Cooke, E. J. .. | McKenzie-st., Murrayville |
| 2079 | Cooper, A.S . Pty. Ltd. | 87 Lambeth-st., Kensington |
| 2088 | Coulstock, K. .. | 65 Welsford-st., Shepparton |
| 2023 | Coulstock, T. R. A... | Allan-st., Kyabram |
| 2072 | Crosthwaite, I. S. .. | Rosebery, Vic. |
| 1937 | Dallimore, P. J. .. | Brook-st., Camperdown |
| 2061 | Devine, P. and Co. .. | Macdonald-st., Numurkah |
| 1964 | Dewez, T. and Co. .. | 120 King-st., Melbourne |
| 2012 | Dimboola Stores Ltd. | Lochiel-st., Dimboola |
| 1973 | Downes, A. J. .. | Ritchie-st., Dunkeld |
| 2004 | Duggan, T. A. .. | Mollisen-st., Kyneton |
| 2080 | Eales, F. .. .. | Bell-st., Penshurst |
| 1976 | Edgecombe, J. H. .. | Hannon-st., Sea Lake |
| 2074 | Egan, B. F. .. | Bolwarra, via Portland |
| 2048 | Egan, F. H. .. | High-st., Avoca |
| 2067 | Einsiedel, E. B. .. | 8 Yendon-rd., Glenhuntly |
| 1969 | Elias, A. .. .. | Tallangatta |
| 1952 | Ellis, C. J. .. | Euroa |
| 2095 | Erwin, V. P. .. | Main-st., Natimuk |
| 1981 | Evans, C. J. .. | 83 French-st., Hamilton |
| 2057 | Evans, W. J. .. | Boort |
| 2060 | Ferguson, F. S. McN. | Market Square, Bendigo |
| 2039 | Flanigan, J. .. | Ross and Murray sts., Colac West |
| 1939 | Freeman Bros. .. | Scott-st., Warracknabeal |
| 1966 | Freeman, W. G. .. | Hervey-st., Elmore |
| 2076 | Gadd, M. C. .. | Walwa |
| 2052 | Gelbart, J. M. .. | 20 Wilson-st., North Carlton |
| 2097 | Gilfuls, W. P. .. | Main-st., Rutherglen |
| 2056 | Gordon, C. G. .. | 645 Spencer-st., Melbourne |
| 2062 | Gorton, C. H. .. | Vickery-st., Alexandra |
| 2027 | Green, T. W. and Co. Pty. Ltd. | Therry-st., Bombala, N.S.W. |
| 2096 | Hallam, F. W. .. | McCollouch-st., Donald |
| 2054 | Hardy, F. A. .. | Myamyn |
| 1957 | Hargreaves Bros. Pty. Ltd. | High-st., Ararat |
| 2000 | Hargreaves, J. R. .. | Terang-rd., Mortlake |
| 1963 | Harris, A. J. .. | 19 Bowen-st., Warragul |
| 2032 | Harris, L. .. .. | Barnes-st., Stawell |
| 1983 | Hateley, R. N. .. | Manangatang |
| 1991 | Haughton, W. and Co. Pty. Ltd. | 545 Little Collins-st., Melbourne |
| 2001 | Heddle, R. L. D. M. | 4 Wellington-st., Kerang |
| 2094 | Hegerty, W. J. .. | c/o F. A. Hill and Co., Charing Cross, Bendigo |
| 1940 | Hicks, J. T. .. | Goroke |
| 2019 | Hill, D. .. .. | 61 Phillip-st., Warracknabeal |
| 2037 | Holdsworth, W. .. | Havelock-st., Beaufort |
| 2089 | Hould, R. J. .. | Byrne-st., Stawell |
| 1968 | Howard, J. H. .. | Commercial-st., Korumburra |
| 2050 | Howlett, A. E. .. | Robertson-st., Casterton |
| 1988 | Jackson, J. Pty. Ltd. | Main-st., Bairnsdale |
| 1942 | James, D. .. .. | 199 Boundary-rd., North Melbourne |
| 1967 | Jobe, C. E. .. | 29 Lower Main-st., Stawell |
| 2003 | Johnson, A. P. .. | Station-st., Lake Boga |
| 2075 | Jones, A. .. .. | Delegate, N.S.W. |
| 2036 | Jones, E. V. .. | Harrow |
| 1947 | Kennon, J. and Sons Pty. Ltd. | River-st., Richmond |
| 1971 | Kewin, R. F. .. | Wheeler-st., Corryong |
| 2008 | Kilroy and Storey .. | High-st., Heathcote |
| 2025 | Lindsay, D. .. | Jeparit |
| 2029 | Lockwood and Sons Pty. Ltd. | Birchip |
| 2043 | Long, C. J. .. | 12 Campbell-st., East Kew |
| 2090 | Love, J. D. .. | 211 Main-st., Bairnsdale |
| 2092 | McAree, M. G. .. | High-st., Echuca |
| 2083 | McClintock, A. E. .. | Digby |
| 2100 | McColl, D. .. | Tatura |
| 2055 | McDonald, I. A. .. | Hanson-st., Corryong |
| 2034 | McGaughie, A. A. J. | Main-st., Cobram |
| 2066 | McLean, A. and Son | Smythe-st., Benalla |
| 1951 | McLennan, D. .. | Webster-st., Wycheproof |
| 2024 | McLennan, D. J. and Sons | Sea Lake |
| 2021 | Marshall, G. J. .. | Edenhope |
| 2085 | Minns, N. .. .. | Minyip |
| 2068 | Moore, D. R. .. | Hamilton-st., Kilmore |
| 1992 | Murrell, H. .. | Murray-st., Casterton |
| 1989 | Murrells and McNicol | St. Arnaud |
| 1993 | Nicklen, T. E. .. | Talbot-rd., Maryborough |
| 2042 | Niddrie, L. G. .. | 27 Lonsdale-st., Hamilton |
| 1986 | North Western Wool and Skin Stores | Gummow-st., Swan Hill |
| 2053 | O'Beirne, J. D. .. | Hamilton-st., Horsham |
| 1958 | O'Beirne, J. and F... | Linton |
| 2035 | Oppenheim, W. .. | 21 Peel-st. north, Ballarat |
| 1985 | Parker, S. K. .. | Hovell-st., Wodonga |
| 2084 | Payne, W. N. .. | Monash-av., Nyah West |
| 2064 | Peach, A. C. J. .. | High-st., Macarthur |
| 2028 | Penney, H. .. | 422 Ascot-st., Ballarat Mt. |
| 1982 | Perkins, C. Pty. Ltd. | Bay-rd. and Sturt-st., Gambier |
| 2006 | Perkins, C. T. .. | Naracoorte, S.A. |
| 1980 | Perry, A. J. .. | Colac West |
| 1962 | Pettit, W. B. .. | 57 McMahon-st., St. Arnaud |
| 1997 | Phillips, T. J. .. | Mologa |
| 1979 | Picknall, J. W. .. | Silvermines-rd., St. Arnaud |
| 1977 | Pyramid Co-op. Society Ltd. | Pyramid Hill |
| 2009 | Quarrell, C. C. .. | Cobden |
| 2030 | Reason, C. T. .. | Pekin-rd., Maryborough |
| 1948 | Rehfisch, H. K. .. | 223 Mair-st., Ballarat |
| 2005 | Rice, J. W. .. | 9 Raglan-st., Ballarat |
| 2026 | Rice, W. T. .. | Bombala, N.S.W. |

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| 2014 | Rich and Gross .. | Brougham-place, Geelong |
| 1995 | Richards, E. R. .. | 1 North-western-rd., St. Arnaud |
| 2093 | Robbins, T. .. | Cohuna |
| 1950 | Robertson, C. N. .. | 9 Little Provert-st., North Melbourne |
| 2098 | Ross, J. A. .. | Walwa |
| 1996 | Ross and Brewster Pty. Ltd. | 1 Little Curran-st., North Melbourne |
| 2069 | Ruedin, U. F. .. | Holdsworth-rd., Long Gully, Bendigo |
| 2022 | Russell, R. .. | Colac West |
| 2011 | Sharrock, C. H. J. .. | Bessiebelle |
| 1984 | Short, I. W. .. | George-st., Hamilton |
| 1946 | Sims Cooper (Freezing Works) Pty. Ltd. | 31 Queen-st., Melbourne |
| 1954 | Stanton, J. .. | Nelson-st., Nhill |
| 2049 | Stephens, J. .. | Murray-st., Colac |
| 2040 | Stone, G. .. .. | Main-st., Cohuna |
| 2041 | Sutton, Miss J. S. .. | Havelock-st., Beaufort |
| 2007 | Taylor, H. G. .. | Birchip |
| 1974 | Teasdale, R. L. .. | Charlton |
| 1936 | Tellie, Nutto .. | Rosebery, Vic. |
| 2082 | Thomas, F. .. | Tintaldra |
| 1953 | Thomas, S. S. .. | Wattle and Victoria sts., Bendigo |
| 1990 | Trigger, M. E. .. | Pinnaroo, S.A. |
| 2087 | Vines, A. A. .. | Robinvale |
| 2077 | Voges, A. V. .. | Hamilton |
| 2045 | Walker, A. .. | Mooroopna |
| 2073 | Warnock, R. .. | Flowerdale, via Yea |
| 2015 | Waters, S. H. and Co. Pty. Ltd. | 514 Little Collins-st., Melbourne |
| 2047 | Westphalen, W. R. .. | Yaapeet |
| 1944 | Wheatland, W. and Co. | Brougham-place, Geelong |
| 1960 | Wheaton, C. M. .. | Miram |
| 1972 | Wilcox Mofflin Ltd. | 34 King-st., Melbourne |
| 2070 | Wingfield, Miss E. H. | Charlton |
| 2091 | Wood, H. L. .. | Balmoral |
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| 1998 | Young, H. .. .. | Orford |
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|---|---|
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| Bartholomew, G., Canterbury-street, St. Arnaud .. | 144 |
| Batey, R. V., Katandra North, via Yabba North .. | 878 |
| Bray, J., 18 Hotham-street, Warrnambool .. .. | 98 |
| Christie, R. R., and Son, Bentleigh .. .. | 829 |
| Coleman, A. J., Mountain-highway, Bayswater .. | 50 |
| Messrs. Corbett Bros., Torbay-street, Macleod .. | 1,317 |
| Davidson, Mrs. A., Sherbrooke-avenue, Ringwood .. | 107 |
| Dawson, R. G., Maldon-road, Castlemaine .. .. | 948 |
| Emmott, J. T., Inglewood .. .. .. | 445 |
| Evans, Geo. R., 10 Mill-street, St. Arnaud .. .. | 177 |
| Gillespie, C., Britannia Creek-road, Wesburn .. | 194 |
| Giovanetti, Mrs. G. E., Skene-street, Kennington, Bendigo | 185 |
| Greenshields, E. J., Lancefield .. .. .. | 669 |
| Hall, R. H., Wal Wal .. .. .. .. | 840 |
| Hamilton, A., "Lyncroft," Flinders .. .. | 485 |
| Hansen, Mrs. M. A., Katandra West .. .. | 88 |
| Harrison, Mrs. A., Shenfield-street, Cobden .. .. | 151 |
| Hemphill, A. E., "Glenara" Poultry Farm, Monegetta | 504 |
| Hilpwell, Mrs. M. C., Maffra .. .. .. | 149 |
| Howard, A. P., Blackhill-road, Kyneton .. .. | 306 |
| Iredale, W. H., 197 Point Nepean-road, Seaford .. | 37 |
| Jones, M. A., Heatherdale-road, Ringwood .. .. | 401 |
| Kell, A. W., 6 Mill-street, St. Arnaud .. .. | 133 |
| Lang, J., 46 Dundas-street, Thornbury .. .. | 54 |
| Lawrie, Mrs. M. J., 107 Albert-street, Sebastopol, Ballarat | 430 |
| Meier, C. G., "Bylands," Sydney-road, McLeod .. | 300 |
| Michell, R., Greensborough-road, McLeod .. .. | 576 |
| Moroney, J. B., High-street, Kangaroo Flat .. | 1,808 |
| McDonald, J., 43 Bloomfield-avenue, Maribyrnong .. | 144 |
| Nichols, Mrs. E. M., "All Red" Poultry Farm, Yan Yean | 732 |
| Orange, Mrs. C., "Lakewood," Marong .. .. | 234 |
| Porter, J., Sherbourne-road, Montmorency .. .. | 284 |
| Poulton, A. W., Vickers-street, Sebastopol .. .. | 1,537 |
| Rae, J., 277 Albert-street, Sebastopol, Ballarat .. | 2,272 |
| Ralph, W. R., Commercial-road, Lower Ferntree Gully | 107 |
| Ridgway, Geo., Callander-road, Noble Park .. .. | 196 |
| Robson, F., 16 Nelson-street, North Wonthaggi .. | 25 |
| Salmond, J. B., Deer Park .. .. .. | 153 |
| Secar, W. T., Station-road, Wesburn .. .. | 89 |
| Shelford, D., Beaufort-road, Croydon .. .. | 141 |
| Shipp, R., P. B., Kerang .. .. .. .. | 511 |
| Smith and Edwards, 61 McPherson-street, Horsham .. | 34 |
| Smith, E., Valley-road, Highton, Geelong .. .. | 1,285 |
| Stant, W. J. and F. E., Westall-road, Springvale .. | 1,505 |
| Sullivan, T., Biggs-road, Coburg, N.14 .. .. | 290 |
| Trinca, M., Valley-street, East Oakleigh .. .. | 1,198 |
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| Whitington, S., 797 Bell-street, Preston .. .. | 93 |
| Wohlers, S., Box 17, Jung .. .. .. | 314 |
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# Some Attractive Potato Dishes

By RACHEL M. PEILE, former Fruit Preserving Expert

The food value of potatoes stands very high. They are an appetising vegetable, easily digestible, always welcome, and the solitary obstacle which often stands in the way of their more frequent use is the housewife's needless fear that daily servings of potatoes mean a monotonous and uninviting menu.

A GLANCE at the range of specially selected recipes below will show that actually there can be almost endless variety in the preparation of savoury and appetizing potato dishes. The housewife who tries them will be helping her purse and the family's health.

If shape, size and quality of skin permit, the best method of preparing potatoes is to scrub them well and bake, steam, or boil them in their skins; thus preventing waste, saving the valuable mineral layer under the skin, obtaining a better flavour and saving time. If preferred, the skin may be removed after cooking. Potatoes can be cut into straws, chips, olives, or ribbons and wet-fried. Apart from the vegetable course, they can be used for soups, scones, entrées, pastry, biscuits, puddings, pancakes, salads, and pies.

### Cocktail Potatoes.

Add butter, salt, and cayenne to some well-mashed potatoes. Mix well, then form into oval-shaped cakes, pressing a hollow in the centre, using a little flour to prevent sticking. Glaze with egg, coat with bread crumbs or flaked oatmeal. Wet fry to a golden brown colour; drain on paper. Cook some cocktail sausages in boiling water. Drain and place three in the hollow of the potato cases. Garnish with parsley. If liked, egg may be added to the potato mixture and it can be used to coat pieces of cooked sausage or bacon. These balls are covered and fried as described.

### Savoury Baked Potatoes.

Bake six fairly large potatoes in jackets. Cut in halves, scoop out centres and mash with one-third cup hot milk, ¼ lb. grated cheese, salt, and pepper. Add stiffly beaten white of one egg. Refill cases and return to oven for 10 minutes. Cooked mince and gravy may replace the cheese and milk in this recipe.

### Shepherd's Pie.

½ lb. cold minced meat; ½ onion (minced); salt; pepper; 2 cups mashed potato; 1 cup stock or gravy; 1 tablespoonful flour; 2 tablespoonfuls tomato sauce.

Grease dish and line with half the potato. Put stock, meat, onion, salt, pepper, flour, sauce into small saucepan and bring to boil and cook 10 minutes. Put into lined pie dish, cover with mashed potatoes, mark with a fork, sprinkle with small pieces of dripping and bake golden brown.

In place of above filling, cold cooked sausages and gravy may be used.

### Mutton and Bacon Pie.

1½ lb. forequarter chops; bacon; onions; potatoes; salt; pepper.

Put layer of chops in dish, then in order, layers of bacon, sliced raw potatoes, and sliced onions. Sprinkle with salt and pepper. Continue till dish is full. Cover and cook 1½ hours. Remove cover and put on short crust or potato crust (see recipe below), bake light brown.

### Poorman's Goose.

2 lb. potatoes; lamb's fry; breadcrumbs; 4 sage leaves; salt; pepper; 1 onion.

Parboil potatoes. Make seasoning of onion, sage, and breadcrumbs. Put a layer of potatoes at bottom of pie dish, then layer of lamb's fry, then layer of stuffing. Repeat till dish is full, finishing with potatoes. Half fill dish with cold water and bake 1–1½ hours. Serve hot with apple sauce.

### Cornish Pasties.

½ lb. short crust; ½ lb. potato; ½ lb. steak; small piece turnip; salt; pepper; 1 small onion.

Dice steak, onion, turnip, potato, add salt and pepper, and mix. Cut short crust into six pieces and roll each into a round. Divide meat mixture, putting some on each round. Damp edges

of pastry and pinch together over mixture. Glaze with milk or egg. Bake ¾ hour in fairly hot oven, gradually reducing the heat. Serve with sprigs of parsley.

### Rolled Steak au Pomme de Terre.

Take steak and scatter over it salt, pepper, pieces of butter, finely chopped sage, and onion. Spread mashed potatoes over and roll up fastening with skewers. Put into casserole with cup of gravy or stock and bake slowly about 2 hours.

### Potato Croquettes.

1 lb. mashed potatoes; salt; pepper; egg yolk; 1 dessertspoonful chopped parsley; 2 level tablespoonfuls butter.

Whip all ingredients together and form into croquettes. Fry golden brown in hot fat.

### Potato Cheese Pie.

Boil six potatoes in their skins. When just soft, peel and slice fairly thickly. Put in layers in greased pie dish. Sprinkle with pepper and cover thickly with grated cheese.

### Curried Potatoes.

1 apple; 1 dessertspoonful fat; 1 onion; 1 dessertspoonful flour; ½ pint milk; 1 tablespoonful curry powder; ½ lb. potatoes.

Melt fat in saucepan, fry diced apple and onion, add flour and curry powder. Brown well. Add milk and stir till boiling. Cut potatoes into dice, stir into curry and simmer 15 minutes. Serve with toast.

### Meatless Cutlets.

½ lb. mashed potatoes; 3 tablespoonfuls cooked beans; 3 tablespoonfuls cooked peas; 2 tablespoonfuls grated cheese; 2 teaspoonfuls mint; 1 teaspoonful mustard; 1 egg yolk.

Mash vegetables together. Add seasoning, then mix in egg yolk. Shape into cutlets and bake in oven in a little fat till both sides are browned.

### Potato Puffs.

4 boiled potatoes; 1 oz. butter; ¼ cup milk; salt and pepper; 2 eggs.

Separate yolks from whites of eggs and beat each. Mash potatoes, adding milk, butter, seasoning, and egg yolk. Fold in the egg whites, stirring lightly. Bake in individual dishes in moderate oven till brown and fluffy.

### Potato Volcano.

6 potatoes; 2 cups grated cheese; 1 tablespoonful butter; 2 eggs; ½ teaspoonful mustard; ¼ teaspoonful soda; ½ cup cream or milk; parsley; ½ teaspoonful salt.

Mash potatoes with salt, butter, and a little hot milk. Add half an egg and pile up on buttered serving dish (Pyrex), leaving hole in the centre. Brush over the top with remainder of egg and brown off top in hot oven. Make a rarebit—melt butter, add cheese, stir till smooth, then add seasonings, soda egg, and cream, stirring till blended. Pour this into central hole in potato. Garnish with parsley. Serve hot.

### Potato Entrée.

1 lb. freshly boiled potatoes; 2 oz. butter; ½ lb. crumbs; 3 eggs; chopped parsley; ½ pint milk, pepper, and salt.

Mash potatoes, add butter, mix with crumbs, beaten egg, salt, pepper, parsley, and lastly milk. Pour into buttered dish and cover with a layer of crumbs. Bake in hot oven for 20 minutes.

### Potato Souffle.

1 lb. potatoes; 1 tablespoonful butter; 3 tablespoonfuls cheese; 2 tablespoonfuls cream; 3 eggs; pinch herbs, salt.

Boil potatoes and mash, using a little of the water in which they have been boiled. Return to saucepan with butter and stir till mixture thickens, pour into basin. Separate yolks from whites of eggs. When mixture is cool, add beaten yolks, cream, seasoning, herbs, beat well, add cheese, beat again. Lastly, stir in stiffly beaten egg whites. Turn into buttered dish and bake in hot oven for 10 minutes.

### Potato and Nut Cakes.

1 lb. mashed potatoes; 5 oz. chopped nuts; 1 egg; 1 tablespoonful butter, salt, pepper.

Add chopped nuts to potatoes, add butter and bind with egg. Season and beat till smooth. Make into round cakes, coat with flour, and deep fry.

### Saratoga Chips.

Peel potatoes, slice very thinly, dry in a towel, drop into hot fat, fry golden brown. Drain in collander. If using frying basket, remove from fat after 2 minutes, heat fat again and plunge in again to brown.

### Potato Straws.

As for chips, but cut in long match-like strips.

### Potato Chips.

In strips about ¼ inch square at ends.

### Potato Ribbons.

Peeled off in long ribbons and fried.

### Potatoes Baked in Jackets.

Scrub potatoes, rub salt into skins or rub skins lightly with butter. Put on enamel plate or dish and bake in oven till tender, about an hour. Cut small holes in top and put in a small teaspoonful of butter and a little chopped parsley.

### Potato Salad.

Serve cold cooked diced, new potatoes, and cooked green peas on lettuce leaves. Mask with salad dressing. Sprinkle with chopped parsley or mint.

### Egg and Potato Salad.

3 cups cold boiled potato; 1 small onion; 3 hard boiled eggs; 1 heaped tablespoonful chopped parsley; salt, pepper, dressing.

Chop onions finely, dice eggs and potatoes. Mix potatoes, onions and seasoning with dressing and chill. When ready to serve, mix in egg and parsley. Pile in lettuce leaves and serve garnished with gherkin.

### Quick Potato Soup.

Cook an onion and a potato of the same size in just enough water to cover. Mash into the water, add a cup of milk and a piece of butter. Thicken with 1 tablespoonful flour moistened with milk. Season with salt, pepper, parsley, and a little sugar.

### Vegetable Soup.

1 large carrot; 1 teaspoonful cornflour; 1 dessertspoonful butter; 4 potatoes; 2 large onions; ½ pint milk; salt and pepper.

Wash vegetables, peel and slice. Cook in a little water till soft; mush to a pulp, add milk, butter, salt, and pepper. Moisten cornflour and add. Stir well. Garnish with chopped parsley.

### White Soup.

1½ lb. potatoes; 2 white onions; 1 parsnip; 1 tablespoonful dripping; 2 cups milk; 1½ tablespoonfuls flour; 2 qts. water; 2 teaspoonfuls salt; 1 teaspoonful sugar.

Wash and peel vegetables and cut up roughly. Heat fat in saucepan and fry vegetables without browning, sprinkle with sugar and salt. Add water and simmer till tender. Rub through collander or sieve. Return to saucepan; add milk. Moisten flour with a little milk and stir in to simmering soup. Garnish with chopped parsley.

### Potato Scones.

1 lb. mashed potatoes; ½ lb. self raising flour, a little milk; pinch salt.

Sift flour and salt, add finely mashed potato. Mix to dough with a little milk. Roll out lightly. Cut into rounds. Put on to hot floured tray. Bake in hot oven.

### Potato Pancakes.

4 potatoes; salt; 3 eggs; pepper; 2 tablespoonsfuls flour; fat.

Wash and peel potatoes, grate into a basin. Stand for about 10 minutes, then pour off any liquid that collects. Add all ingredients and mix well. Drop in spoonfuls into the pan and fry until golden brown.

### Almond Potatoes.

1 mashed potato; beaten egg; 1 tablespoonful grated cheese; pinch cayenne; ¼ teaspoonful salt; shredded almonds, paper cases.

Mash potato till smooth, add flavouring and cheese. Bind into balls with a little of the egg. Dip in egg, roll in almonds and wet fry.

### Potato Savouries.

These can be made by using potato chips in place of biscuits for savouries. They should be sprinkled with salt and pepper and decorated with tomato, cheese, gherkin, olive, &c.

### Potato Lemon Pie.

½ lb. potatoes; 1 tablespoonful butter; 2 eggs; ½ cup milk; ½ cup sugar; juice and rind of half lemon; ¼ teaspoonful cinnamon; pinch salt; 6 oz. pastry (short crust).

Boil and mash potatoes, adding all ingredients and mixing well. Line plate with pastry. Pour in mixture. Bake in moderate oven. Before removing from oven, nuts may be sprinkled over.

### Potato Pudding.

1 qt. milk; ¼ lb. flour; ¼ lb. mashed potato; 1 oz. butter; 3 eggs; 2 oz. sugar; 1 teaspoonful salt; flavouring (grated lemon).

Mix flour to a smooth paste with a little milk, heat rest of milk, and when boiling, stir in flour, butter, potatoes, flavouring. When cooled slightly, add eggs, well beaten. Pour into buttered pie dish and bake till brown and set, about ½ hour.

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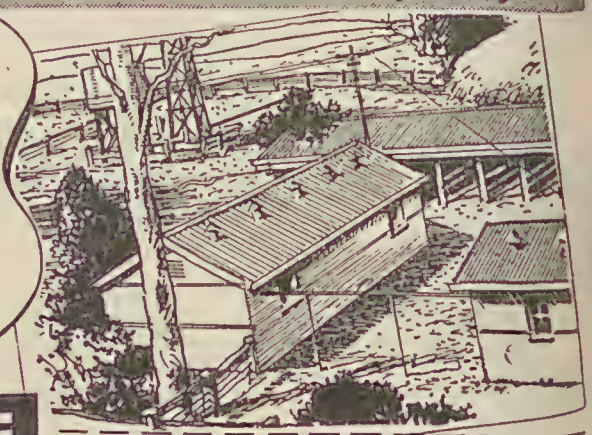

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# SOIL DRIFT AND CONTROL MEASURES

By H. L. Hore, B. Agr. Sc., Inspector of Agriculture, Member of the Soil Conservation Board.

The purpose of this article is to indicate the nature of the wind erosion problem in Victoria and to describe control methods which may be used to overcome or minimize the damage caused by loss of top soil, and drift. The areas most affected by wind erosion in Victoria are the wheat and grazing lands located in the northern portion of the Wimmera and the Mallee districts, which area is dealt with in particular. Wind erosion is accelerated when the soil is denuded of its protective cover or other herbage. This condition arises mainly during drought periods such as have been experienced recently.

### *TOPOGRAPHY OF THE MALLEE*

LOCATED in the north-western corner of the State the main topographical features of the Victorian Mallee areas consist of a series of ridges, troughs and basins. The main ridges, of which there are several, run roughly in a north-south direction. The highest of these main ridges reach to 350 feet above sea level. Running nearly at right angles to the main ridges, i.e., approximately east and west, are innumerable small rises and ridges which vary in height from a few feet to 50 feet above the general level of the country. It is these smaller ridges, usually referred to as sandhills, which are such a common feature of the Mallee areas.

### *Soil and Rainfall*

The surface soils of the Mallee can be classified very broadly as clay loams to sandy loams and sands. In some places limestone as sheets, boulders, or rubble appears on the surface. The heavier soils, that is those containing the greatest proportion of clay are to be found on the flats or troughs between the sandhills.

The rainfall of the area is low and variable, the average annual recordings vary from 14 inches in the Southern Mallee to 9 inches in the Millewa districts in the far north-west. The variation in the average annual rainfall and the fact that a considerable portion of the rain may be recorded outside the critical months for growth of grass and crops make conditions more difficult.

In addition to the gradual deterioration in rainfall as one travels from south to north, the sandhills gradually become more frequent and increase in height and the soils generally are of a sandier nature and more liable to erosion.

### *Clearing and Cultivation*

In its natural state the Mallee carried, over its greatest part, a wide range of vegetation well suited to the climate of the area. The vegetation comprised various species of trees, shrubs and grasses. Of the trees the predominant type was a eucalyptus species commonly referred to as mallee. There was also a fair proportion of belar and pine frequently growing in association, and some plain country usually covered with natural grasses.

During the course of settlement, clearing proceeded with little regard to the topography or the type of the soil, and the native vegetation was removed over extensive areas in order that crops could be sown.

With the vegetation removed from soils that will readily blow, located in a region of 9 to 14 inches annual rainfall and subject to periodical droughts, together with farming methods which involve cultivation of the land, the stage is set for wind erosion and soil drift which takes the form of dust storms, with soil and sand drifting along the surface of the ground until it meets an obstruction against which it is piled.

### *Causes of Erosion*

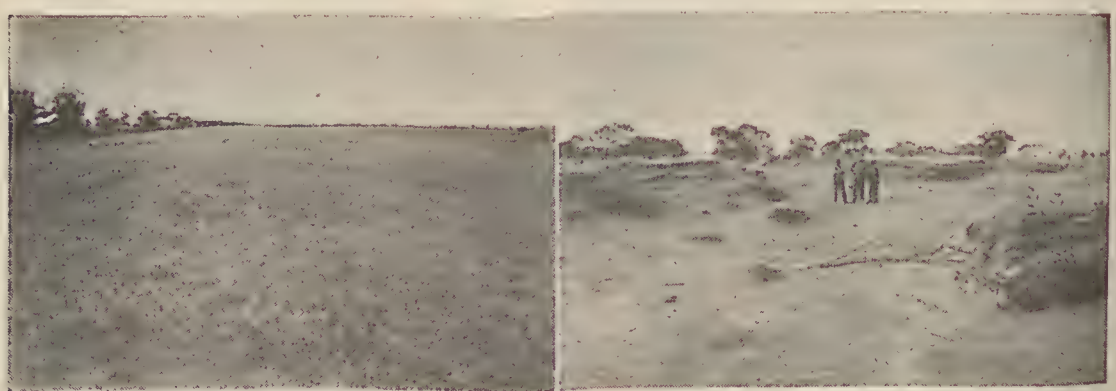
Apart from the peculiarities of soils and climatic conditions of the Mallee, which factors cannot be controlled by man's efforts, there are a number of causes which aggravate the

Sand drift on a Mallee road.

erosion problem in this area. Chief among these is the destruction or removal of cover for the soil by such practices as stubble burning, and excessive grazing both in regard to the number of sheep carried and grazing the land for too long a period once the cover has commenced to deteriorate. It was realized even in the early stages of settlement that the production of wheat under the low rainfall conditions experienced, is uncertain unless fallowing and cultivation are carried out. The practice of bare fallowing which normally leaves the soil in a loose unprotected condition over the summer months greatly accentuates the amount of erosion in the Mallee and is the main cause of soil drift in the Wimmera.

In some cases the original holdings were too small to be operated economically, and as wheat was the main revenue crop excessive cultivation was practised in order to obtain a living from the area. Likewise with the fall in the price of wheat most farmers grew additional areas, or cultivated and seeded the same land more often in order to produce more wheat and so offset the drop in price.

Mallee lands are very easy to plough and cultivate and this factor favours the fallowing of large areas, frequently by sharefarmers, whose main objective is to obtain a maximum return for labour expended, and who give little, if any thought to the matter of maintenance of the soil. A very similar condition exists on hundreds of other farms where, on account of low prices for primary products, poor seasons and other factors, the financial position of the farmer has so deteriorated that he has now lost all equity in his holding. Under these circumstances, combined with the difficult summer conditions and lack of many of the amenities of life available elsewhere, it is easy to understand that the importance of erosion prevention may not even be considered by the farm occupier. Good farming practices can not be expected in the absence of continuity of tenure. Tenants have little incentive to adopt practices that will lower their immediate incomes even though such practices would return greater incomes over a period of years. This aspect of the erosion problem is a very important one, but is outside the scope of this article which in the main is intended to deal with the agricultural factors involved.



Left—A sandridge which has been carefully farmed. Right—Portion of the same ridge in a neighbour's paddock.

A dust storm approaching a Mallee town.

### *The Effects of Wind Erosion*

Wind blowing along the surface of the soil has a winnowing action which lifts the lighter more fertile particles of the soil, and transports them in the form of dust for long distances. The coarser less fertile particles are rolled along the ground where they pile up against fences, trees and other obstructions in the form of drift banks. Removal of this sand and soil from water channels, roads, railways, fences, &c., costs thousands of pounds each year. The soil which drifts along the surface is a constant reminder of erosion, but the loss of soil fertility by the removal of the finer more fertile portions of the soil as dust is frequently overlooked. Chemical analysis of wind-borne dust shows that the dust is richer in a number of ingredients essential for plant growth than the normal Mallee soil.

Removal of the surface soil exposes the hard underlying subsoil which is usually much less attractive and more difficult to work than the normal topsoil. It is usually difficult to obtain a growth of crop or grass on these eroded areas, and they remain as scars for years until definite steps are taken to establish vegetation on them.

Where sandhills are present, if erosion is allowed to proceed unchecked, the surface soil may be blown off the side and top of the hill and piled as a loose sand dune on the lee side. By the action of the wind from different directions such dunes may be built up to a considerable height. These dunes usually move slowly in a north-eastern direction and can not be worked or crossed by machinery. This dune formation is very noticeable in the northern Mallee this season.

During high winds the sand which is blown along the ground has an abrasive action which may be serious from two points of view. Firstly, the flying sand damages and may even cut off near ground level young plants which have been sown or have germinated naturally, thus destroying the herbaceous ground cover so necessary as a means of holding the soil.

Loose sand dune caused by wind erosion.

Fallow paddock showing large patches blown bare of mulch.

The formation of fruit on trees and vines may also be affected. Secondly, the abrasive action of the sand on the soil itself tends to break down clods, loosen the surface, and set other land drifting. Frequent duststorms have a very depressing effect on persons who have to live in the area concerned and large amounts of dust may be injurious to health.

### *Control Measures*

The prevention or control of soil erosion is bound up with the correct use of land. If it is found necessary to clear the land and develop it for agricultural production, then it is incumbent upon the land user and the community generally to ensure that the land is farmed in such a way that its fertility is maintained for future generations. Good farm husbandry consists not only of producing but continuing to produce good crops. Soil erosion not only reduces fertility, but is responsible for the loss of the actual soil itself. The land user should, under proper guidance, be able to develop a system of agricultural or pastoral management which would safeguard the soil against erosion. That this can be done under Mallee conditions has been demonstrated by quite a number of farmers in this area whose properties even after the recent droughts show little evidence of serious erosion.

A well-ridged cultivation paddock on a Mallee property.

It must be accepted that some soil drift will always be a feature of farming in the dry areas, and that no simple method will be devised to prevent it completely. However, there are farming methods and practices which will greatly minimize erosion. As indicated earlier, fallowing and cultivation are major factors in soil erosion in the Mallee. Although crops grown on land which has been bare-fallowed in the normal way produce the heaviest yield, modifications of this practice on light land which drifts readily are desirable in

order to reduce drift and prevent the deterioration of the soil over a period of years.

The extent to which it is necessary to modify normal bare fallowing practices will depend on the nature of the soil, the locality, and the season. In the Wimmera districts and on the heavier soils in the southern Mallee it has been found that, provided the fallow is not worked too fine and is kept well ridged, little if any drift will occur in normal years. As one proceeds further north and on the lighter soils other measures are necessary to reduce drift.

**Avoid Excessive Cultivation.**—Frequent cultivation of the fallow before early autumn, and dry working, should be avoided, since they break down any clods and accelerate the natural tendency of the soil to become fine and powdery. However, when rains are received in the autumn no opportunity to work the land should be neglected. It is at this time of the year that most of the soil drift takes place, and the ridges left by cultivation materially retard the movement of the soil, moisture is conserved for the subsequent crops, weed seedlings are destroyed, and the land is left in good condition for seeding.

**Later Ploughing.**—On very drifty land, late fallowing frequently will result in less drift. The initial ploughing or cultivation of these areas may be delayed until the spring, or even autumn, depending on the liability to drift, but in order that yields will not be too seriously affected, weeds and other rubbish growing on such late-fallowed areas should be kept under control by judicious grazing with sheep.

**Grazing Instead of Ploughing.**—As an alternative to late fallowing of light land, such areas could be sown in the winter with a cereal crop, preferably oats or ryecorn, grazed until the autumn, and then cultivated in readiness for the wheat crop. It should be understood, however, that if the crop for grazing is fed off too severely, the land will drift just as badly as does normal fallow.

**Cover Crops.**—In tests at the Mallee Research Station at Walpeup, cover-crop fallows have been found to be very effective in controlling drift. This practice involves sowing a cereal crop in the spring on land which has been fallowed and treated in the normal manner up to this time. The crop, sown in the spring, is grazed down after the plants have become firmly established, and provided sufficient roots and stalks are left to hold the soil over the summer months, this treatment offers one of the most effective means of controlling drift on fallowed land. Its chief disadvantage is that, in drought years, there may not be sufficient rain to ensure germination and growth of the cover crop.

The above modifications of normal cultivation practices have been shown by experiments to result in a slightly lower yield of the following wheat crop grown on the area, but this is offset to some extent at least by the

Grazed stubble of cover crop preventing soil from drifting on sandy rise.

Ridging a fallow in the autumn.

value of the extra feed available for sheep. In addition, the soil is conserved for future years.

**Different Treatment for Drifty Areas.**—It is the usual practice on a Mallee farm to apply the same fallowing and cultivation treatment to the whole paddock, both hills and flats within its boundaries. While this procedure has the obvious advantage of convenience in working, it is definitely not satisfactory from the erosion control point of view. The different parts of a farm or paddock should be farmed or worked according to the type of soil. If this principle were intelligently applied, erosion could be practically eliminated in all but exceptionally bad years. While the flats may be fallowed in the ordinary way, the hills, if fallowed at all, should be broken up later in the season, worked less often or sown with a cover crop to hold the soil. If not given special treatment the hills are the first parts to start drifting, and in doing so they may also set in motion other portions of the paddock which would otherwise remain relatively stable. Drifty areas near roads, railways, and water supply channels, where the cost of removing the sand is likely to be greater than the benefits derived from fallowing, should not be fallowed at all.

The roughing up of blown patches on fallow, as illustrated, catches the sand, and retards drift.

**Special Ridging.**—The ridges or surface corrugations left by cultivating machinery are of assistance in reducing drift on cultivated land. In the Wimmera district the chief method of preventing soil drift on fallowed land

is to ridge the soil when it is blown flat. Fallow does not drift while the ridges persist, but, unfortunately, the ridging effect of normal cultivating implements does not last long in high winds. In order to obtain larger and more effective ridges in the soil special attachments may be used on cultivating implements, or furrows may be ploughed. As far as practicable these are put in at right angles to the prevailing wind. Special furrowing and ridging of the soil is useful as a temporary relief measure, particularly in an emergency such as may arise in drought years.

A modified form of ridging is practised with considerable success by some farmers. After showers of rain which do not provide sufficient moisture for a general cultivation, those portions of the fallow which have flattened and commenced to "run" are again ridged up—in other words the drifty portions are patched out. With a tractor and cultivator many such areas can be treated in a short time while the soil is still moist enough for cultivation, and the treatment will stop a considerable amount of drift. It is carried out, of course, only in the late summer or autumn months.

Whenever hard, blown patches appear on the fallow or on grazing land they should be roughed up with a plough or other implement, or covered with stable manure as soon as practicable. These patches act as focal points for erosion and soon enlarge if not attended to.

**Non-burning of Stubble.**—Where the land to be fallowed carries a crop stubble or other trash, such material should not be burnt but retained to protect the soil. The presence of straw on or near the surface of fallowed land will assist very materially in reducing the amount of soil drift. In fact the non-burning of stubbles is now the most commonly practised wind erosion control measure.

Where a long rotation is practised there is not sufficient straw left to be of much value as a protection against erosion. Under these conditions some farmers sow a crop of oats or barley for seed on ley ground and in the next season utilize the stubble of this crop to hold the fallows.

Many farmers burn stubbles to reduce plant diseases in the subsequent wheat crops. However, burning of stubbles is only part of the control of crop diseases, some of which (e.g., flag smut) can be largely overcome by the use of resistant varieties. If "Take-all" is troublesome do not sow the paddock to wheat for some years. Prevention of drift may be more important than "Take-all" control.

Another reason for burning of stubbles is that the farmer may not possess cultivating implements capable of handling the stubble present. Where oats, particularly oats for hay, follows wheat, it is common to burn the wheat stubble to enable the oat crop to be sown with a combine. If the stubble must be burnt, the burn should be left as late as practicable, and then only thinned out sufficiently to enable the combine to get through. The suggestion to sow oats for hay on fallowed land and utilize stubble land for grazing is well worth considering. The amount of feed on stubble areas would be greatly increased by disking in an oat crop. The use of a disc implement would obviate the necessity to burn the stubble which would remain to protect the soil in the event of failure of the oats.

**Strip Cropping.**—One of the most effective methods of preventing soil drift in the United States of America is by means of strip cropping. This involves sowing of the crops in strips across the paddock, or farm, at right angles to the prevailing winds. Alternated with the strips of growing crops are strips of cultivation which may vary in width from about one chain to five chains. The growing crop provides a protection to the cultivated land from the wind, and, in addition, the crop or stubble adjacent to cultivated areas catches

Sowing barley in a heavy stubble with drill and disc harrow combination.

and arrests any soil which may move, before it has travelled far Where strip cropping is practised, stock, if carried, are not pastured extensively in the fields. In Australia, the fact that stock are maintained almost exclusively in the paddocks is a serious bar to the introduction of strip cropping.

**Rotation of Crops.**—The rotation of crops has a bearing on the amount of soil drift occurring on a farm. A short rotation of fallow—wheat which provides the greatest amount of stubble for utilization as a drift control factor on the fallow, involves larger areas under cultivation and hence more land in a condition to drift readily. There is also evidence which indicates that a short rotation of fallow—wheat, practised over a long period of years, reduces the fertility of the soil and leads to deterioration of its physical condition. In the interest of soil conservation the rotation adopted on a Mallee farm should be such that not more than one-third of any farm in heavy land, or one-fourth of the farm in light country is bare fallow at any one time. There is no hard and fast rotational practice in the Mallee, the most common being a three-course rotation of fallow—wheat—oats, or fallow—wheat—grass, or a four-course rotation of fallow—wheat—oats—grass, or fallow—wheat—grass—grass. Longer rotations, which include a period of a few years out to grass may assist in consolidating the ground and improve its mechanical condition so that it is more stable under the action of wind. Also the grass roots will tend to hold the soil in a sod when it is again ploughed.

There are many factors which make the adherence to a fixed rotation of crops in the various paddocks very desirable. Under Mallee conditions, however, in order to control drift as far as practicable, it is sometimes very necessary to depart from a fixed rotation. Every effort should be made to utilize crop stubbles along the lines indicated earlier, to provide maximum protection for the soil and, if the prospects of obtaining adequate self-sown feed are not good, a cereal crop for grazing should be disked in. The length of time a paddock is left out to grass may be governed by the amount of natural cover it produces. The quantity and quality of the feed in many paddocks deteriorates rapidly, and once a paddock starts to thin out and show bare patches it should be cultivated and sown with a cereal crop.

Oats sown for grazing on wheaten stubble land. The stubble provides protection for the young crop.

### *Control Measures on Non-Cultivated Land*

It is frequently contended, mainly by those with little practical knowledge of Mallee conditions, that in order to stop erosion, cultivation should be prohibited and the land used for grazing only, or allowed to revert to scrub. Some of the worst examples of wind erosion in this State at the present time are located on blocks of land which have not been cultivated for many years. When Mallee land is left out of cultivation it will usually develop a mixed cover of grass and other volunteer cover, including in some cases shoots of mallee and shrubs. If grazing by sheep and rabbits were rigorously excluded it is probable that sufficient cover would be developed over most of the area to hold the soil. In practice, however, it frequently happens that with grazing and/or adverse seasons the cover thins out and bare wind-scoured patches develop.

[*Continued on page 263.*

# Maffra Lucerne and Irrigated Pasture Competitions, 1944-45

By L. C. Bartels, B.Agr.Sc., Senior Agrostologist.

Irrigated pastures on a Boisdale farm.

MAFFRA ranks as one of the most important farming districts of Victoria—a position secured for it by the existence of big areas of fertile land, by a very reliable irrigation scheme, and by the enterprise of the settlers.

Dairying eclipses other activities at Maffra, and the sustained production of dairy products has been a valuable contribution to the nation's war effort.

There is scope for greater production, and realizing that, the Maffra Agricultural Society seeks to promote better farming methods by a steady educational campaign, competitions to promote the efficient use of water, and better culture of lucerne and pastures, and by sponsoring discussion groups for the interchange of ideas between farmers. The State Rivers and Water Supply Commission co-operates by providing free irrigation water as prizes for the competitions.

The recent competitions attracted many entrants and definite progress is recorded. Maffra has often appeared to better advantage because, in common with most of Victoria, it has suffered a severe drought, and the rain which has fallen came in sporadic falls at wide intervals. (It is pleasing to note that good rains fell in April, bringing relief in the unirrigated territory.)

From discussions with settlers evidence emerges that there is a better appreciation of mixed pastures, the need for judicious watering, and the value of liberal manuring. Undoubtedly the wise application of this knowledge will enable Maffra farmers to consolidate their position.

Excellent lucerne stands and pastures are grown, but unfortunately there are two serious troubles which are recurring problems at Maffra. In order of seriousness they are bloat in cattle and the occasional visitation of cut-worms. Both caused trouble this year; in fact, the depredations of the cut-worms on the luxuriant spring growth of pastures reduced the amount of conserved feed. Grazing the resultant short pastures at narrow intervals was conducive to bloat in the cattle; farmers did not have the means to relieve the situation by hand feeding because of the drought. These problems warrant the closest investigation.

There is a common opinion at Maffra that regulated grazing to widen intervals between grazings is the best way to avert the risk of bloat, and some farmers are emphatic that a period of 21 to 28 days between grazings ensures safety. It is interesting to note that one farmer who had eliminated bloat by application of the above methods was forced by the results of the cut-worm invasion to revert to frequent movements of his cows, with the result that bloat has recurred in his cattle in consequence of the animals having to graze short feed.

### *The Lucerne Competition*

First prize in the lucerne section was awarded to Mr. C. Lambrecht, who presented for inspection an area of lucerne sown in 1942 on land which had previously grown sugar beet. After the beet was lifted the land was cultivated, graded, and checkbanked, and sown late in August. The seeding rate was 17 lb. per acre, but no manure was applied at sowing. In the second year the area was top-dressed with "super"—1 bag per acre—and in the following year with 2 cwt. per acre.

A first cut had been taken off in November, yielding 30 cwt. of hay per acre, and the crop exhibited in early December, when the first visit in connexion with the competition was made, gave promise of a second heavy cut. The lucerne was strong and dense, and had not reached the flowering stage. At the second inspection in March the crop was in beautiful condition—uniform, fresh, and clean.

Mr. Lambrecht is in the Riverslea area, a new section of the Maffra Irrigation District, and has made notable progress. The excellent workmanship reflected in this competitor's lucerne characterizes most of the crops on his farm.

Mr. W. E. Vardy, who secured second place, showed an area of lucerne (5 acres) sown in 1943. The land had previously borne natural grass and, in the preliminary stages of irrigation it was sown to annual summer crops. In preparation for lucerne the land was fallowed, cultivated, graded, and checkbanked, and the crop was sown in September at the rate of 10 lb. of seed with a bag of superphosphate per acre. The seed was sown broadcast and in the first year it had one watering only—at the end of January, 1944. The crop inspected in December had received one watering only, but it was an outstanding crop—heavy and clean. It was not quite uniform, however. The land had varying slopes, but the channeling and banking had been carefully constructed to meet this condition. Unfortunately, the lucerne had been mown just before the second inspection.

Mr. Vardy is a firm believer in manure. He had given six bags of "super." to the five acres and had limed a section, but in this latter portion there was no apparent difference in the crop.

Mr. M. R. Davis the third prize winner exhibited 5 acres of lucerne which showed to advantage at both inspections. The area was well laid out for irrigation and channels were clean.

The lucerne was sown in the spring of 1941 on land which previously had been repeatedly cropped with oats. Twelve pounds of seed was sown per acre with one bag of superphosphate. Mr. Davis has applied two bags per acre of superphosphate every year—one bag in early spring and one bag in summer, and is convinced that this quantity is beneficial.

The lucerne is always cut, never grazed. Five crops are obtained and the lucerne is watered once between cuts. The ground absorbs 6 inches of water at each watering. Mr. Davis considers that lucerne is benefited by winter scarifying after the stand is 3 years old.

An excellent crop of lucerne grown by Mr. W. E. Vardy.

### *Pasture Competition*

Mr. H. J. Hallows was awarded first prize in the section for the best paddock of irrigated pasture, not less than 5 acres. The pasture was sown in autumn 1941 with the following mixture:—

10 lb. Certified Victorian Perennial Rye Grass;
3 lb. Cocksfoot (Victorian seed);
2 lb. New Zealand White Clover.

To test the response Mr. Hallows had topdressed this section of his pasture at the rate of 5 cwt. of superphosphate per acre, and when rationing of fertilizers is lifted he intends to treat the whole farm at that rate, or heavier.

A good stand of unirrigated lucerne grown by Mr. E. G. Wyeth, Newry.

The pasture was watered six times during the season and in that period had suffered an invasion of cut-worms.

Mr. L. Donohoe, of Boisdale, was awarded second prize for an area of 6 acres of pasture which was sown in 1934 with certified perennial rye grass, white clover and cocksfoot.

It has been topdressed regularly at rates varying from one bag per acre to 4 cwt. per acre. Last year the land was topdressed with lime (12 cwt. per acre) in addition to the superphosphate.

The area is neatly laid out, and the pasture presented a nice appearance at both inspections. It was generally clean, although thistles, ribwort and mustard were blemishes. The pasture had not been hard grazed.

Mr. M. R. Davis who secured third place showed a paddock of pasture 11 acres in area. This pasture had been sown in 1944. The land had been cultivated for many years and the pasture followed on a crop of beet.

The following seed mixture was sown in the spring:—

| | Per acre. |
|---|---|
| Perennial rye grass .. | 1 bushel |
| Cocksfoot .. .. | 3 lb. |
| Cow Grass .. .. | 2 lb. |
| Alsike Clover .. .. | 1 lb. |
| Subterranean Clover .. | 1 lb. |
| Lucerne .. .. | 1 lb. |
| White Clover .. | ¼ lb. |

The seed was sown with superphosphate, one bag per acre. The seed and manure were mixed and the mixture broadcast. The pasture received one bag of "super" per acre since summer.

The pasture has been subjected to heavy grazing since it was established. At the first inspection the annual species were too prominent, but during the summer the paddock was watered five times and the total application of water was about 2 feet.

Before the second inspection the pasture had been clipped and it presented a good appearance with a good balance of species.

Mr. Davis considers that no annual summer crops were needed if an area of lucerne is maintained in addition to pasture.

### *An Example of Progress in the Newry District*

Development of the Newry district is illustrated by the progress of Mr. N. Marks who has been a share-farmer on his present block for 25 years, and is now with Mr. Don Manson. This competitor exhibited 6 acres of mixed grasses and clovers under irrigation sown eight years ago on land reduced through continued cultivation. The pasture has been topdressed every year with 1 cwt. of superphosphate per acre. It is usually watered regularly and grazed systematically four days in twenty. This year the pastures had a visitation of cut-worms, which caused a shortage of feed.

## THE LUCERNE COMPETITION.—LIST OF AWARDS.

(Area Not Less Than Five Acres.)

| Name of Competitor. | Layout of Land for Irrigation, Condition of Channels and Drains. | Condition of the Crop. | Uniformity. | Apparent Yield at Time of Inspection. | Freedom from Weeds. | Total Points Awarded. |
|---|---|---|---|---|---|---|
| Maximum Points .. .. | 20 | 20 | 20 | 20 | 20 | 100 |
| Lambrecht, C. .. .. | 19 | 19 | 19 | 12 | 19 | 88 |
| Yardy, W. E. .. .. | 20 | 18 | 18 | 12 | 19 | 87 |
| Davis, M. R. .. .. | 19 | 18 | 18 | 12 | 19 | 86 |
| Donohoe. L. (R. Bedgood) .. | 18 | 19 | 18 | 12 | 19 | 86 |
| Pearse, E. T. .. .. | 18 | 18 | 19 | 9 | 18 | 82 |
| Singleton, R. G. D. .. .. | 18 | 17 | 15 | 15 | 17 | 82 |
| Guthridge, R. A. .. .. | 18 | 18½ | 17 | 9 | 18½ | 81 |
| Gilder, F. .. .. .. | 16 | 18 | 16 | 9 | 20 | 79 |
| Amey, W. .. .. .. | 18 | 17 | 17 | 8 | 18 | 78 |
| Onley, F. B. .. .. | 10 | 18 | 17 | 11 | 18 | 74 |
| Whittaker and Onley .. | 10 | 17 | 19 | 8 | 19 | 73 |
| Wyeth, E. G. .. .. | .. | 19 | 18 | 9 | 20 | 66 |
| Wisely, D. B. .. .. | .. | 17 | 17 | 7 | 18 | 59 |
| Marks, N. .. .. .. | .. | 17 | 18 | 4 | 18 | 57 |
| Benson, F. W. .. .. | .. | 18 | 10 | 5 | 18 | 51 |

## THE IRRIGATED PASTURE COMPETITION.—LIST OF AWARDS.

(Area Not Less Than Five Acres.)

| Name of Competitor. | Layout of Land for Irrigation, Condition of Channels and Drains. | Condition of the Pasture. | Uniformity of the Pasture. | Mixture and Balance of Species. | Freedom from Weeds. | Total Points Awarded. |
|---|---|---|---|---|---|---|
| Maximum Points .. .. | 20 | 20 | 20 | 20 | 20 | 100 |
| Hallows, H. J. .. .. | 18 | 19 | 19 | 19 | 18 | 93 |
| Donohoe, L. (R. Bedgood) .. | 19 | 18 | 18 | 19 | 18 | 92 |
| Davis, M. R. .. .. | 18 | 18 | 18 | 18 | 19 | 91 |
| Benson, F. W. .. .. | 18 | 18 | 18 | 18 | 18 | 90 |
| Pearce, E. J. .. .. | 18 | 19 | 17 | 19 | 17 | 90 |
| Stockel, K. .. .. .. | 18 | 17 | 17 | 19 | 19 | 90 |
| Weatherley, R. .. .. | 18 | 18 | 18 | 18 | 18 | 90 |
| Marks, N. .. .. .. | 18 | 17 | 18 | 19 | 17 | 89 |
| Singleton, R. G. D. .. .. | 19 | 16 | 17 | 18 | 19 | 89 |
| Cranmer, W. J. .. .. | 17 | 17 | 18 | 18 | 18 | 88 |
| Gilder, F. .. .. .. | 18 | 16 | 17 | 18 | 18 | 87 |
| Smith, H. M. and Sons .. | 18 | 17 | 16 | 18 | 18 | 87 |
| Wisely, D. B. .. .. | 17 | 17 | 17 | 18 | 18 | 87 |
| Marshall, H. .. .. | 18 | 17 | 18 | 16 | 17 | 86 |
| Whittaker Bros. and Onley .. | 19 | 16 | 17 | 18 | 15 | 85 |
| Higgins, J. .. .. .. | 18 | 16 | 15 | 18 | 18 | 85 |
| Amey, W. .. .. .. | 17 | 17 | 16 | 18 | 17 | 85 |
| Guthridge, R. A. .. .. | 18 | 15 | 16 | 19 | 16 | 84 |
| Lambrecht, C. .. .. | 18 | 14 | 16 | 19 | 17 | 84 |
| Wyeth, E. G. .. .. | 16 | 14 | 15 | 18 | 17 | 80 |

Mr. Marks had an exhibit of 8 acres of unirrigated lucerne. The stand was eight years old, and the land has grown lucerne for 24 years. The stand is kept for cutting and provides four and five cuts every season, aggregating 5 tons of hay. This stand typifies a common feature of the district—the wonderful productivity of unirrigated lucerne. This year the condition of the lucerne reflected the dry season, but the growth was remarkable in the circumstances.

[Continued on page 246.

# Full Market Value for Pigs

By L. A. DOWNEY, H.D.A., Pig Expert

WHETHER slips, stores, baconers or backfatters; whether sold at auction or privately, alive or dead, there is satisfaction and financial reward for the man who prepares and delivers his pigs for sale in a condition that appeals to the buyer.

The preparation of pigs for market commences with their breeding, and at that stage it is desirable to use only the best available boars and sows, selected when possible on their progeny rather than on their appearance.

The development of a pig's inherited capacity for growth depends on the quantity and varieties of foods it receives at each stage of its growth and fattening. The pig-raiser's objective is to manipulate breeding and feeding together, so that the pigs are in right condition when they reach the desired weight for slaughter.

The bacon trade, reflecting the desires of bacon consumers, is very exacting in the specification of proportions of fat and lean required in bacon pigs—about 1 inch of back fat being required on the thinnest part of the loin of a 140-lb. baconer carcass, and a deviation of more than a quarter-inch above or below that standard is looked upon with great disfavour.

Full reward for having bred and fed pigs of the desired weight, conformation, and condition should not be expected if other factors concerned with the delivery of attractive pigs are neglected.

Appearance counts when it comes to selling, and pigs suffering with skin eruptions caused by lice and mange mites are handicapped at a sale. These skin parasites not only reduce the sale price but they also retard the pigs' growth-rate on the farm. Their control is relatively simple, and may be accomplished by the application of oil and sulphur to the pigs' skin. More detailed information on the treatment of pigs for mange and lice may be obtained in a pamphlet issued by the Department of Agriculture. This pamphlet will be forwarded free of charge on application to the Director, Department of Agriculture, Melbourne, C.2.

Superficial blemishes caused by pigs fighting or being struck with sticks or other hard objects, and deep-seated injuries such as bruises caused by kicks with a man's boot, and ruptured muscles and blood vessels caused by rough handling, or by strain when a pig slips its leg in the space between the loading ramp and the vehicle, all depreciate the pigs' value either at the sale of the live pig or at the sale of cured bacon and ham.

To reduce such injuries and subsequent loss, pigs should be handled as carefully as practicable. A bag or a strip of canvas is usually more effective for driving a stubborn pig and is less harmful than a stick or a man's boot.

Loading ramps should be kept in repair, and care should be taken to avoid a space between the ramp and the vehicle into which the pigs' legs might slip when the animals are being loaded or unloaded.

Pigs should not be fed immediately prior to being loaded for market, because the food consumed at that time does not give the pig-raiser any financial return, and it may cause the pigs to be sick in transit. Pig buyers at auction are not influenced in their estimation of carcass weights by the fullness of the pigs' bellies, and when buying live pigs over scales the buyers usually make allowance for pigs which are full.

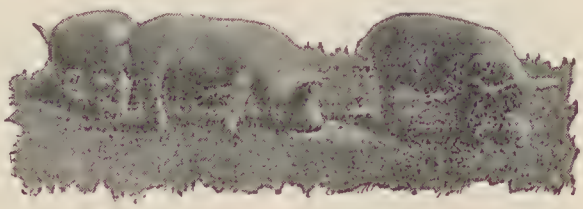
Besides damage to carcasses, there is a serious complete loss caused by deaths of pigs in transit from farms to works; in many cases these deaths are preventable, and to avoid such wastage every care should be taken by every one concerned.

When being loaded at the farm and unloaded at the sale yard or railway pens, pigs should be treated as carefully and quietly as possible to avoid unnecessary excitement and exertion. Shade should be provided over the pigs while they are in transit and while at the sale and railway yards, and overcrowding in vehicles or pens should be avoided.

Backfatters and choppers should be partitioned off from baconers or smaller pigs, and all possible care should be taken to prevent pigs from fighting.

Pigs are a fragile product, although damage is not always apparent at the time it is inflicted, *and while most deaths in transit occur in railway trucks the primary cause is often the excessive exertion suffered by the pigs before they are placed in the trucks.*

The wastage of food and the financial loss to individuals and to the nation through injuries and deaths among pigs from the time they are loaded at the farm until they reach the meat works is serious. It can be reduced substantially if those people handling pigs will realize how the damage is done, and then exercise more care.



## MAFFRA LUCERNE AND PASTURE COMPETITIONS—*continued from page 244.*

When Mr. Marks commenced, 40 acres of the block was under lucerne, leaving 90 acres of natural pasture, although 4 or 5 acres of maize for pig feed was usually grown. The lucerne was always cut and fed to stock and this was done for nine months of the year. What was not eaten green was cured and stored. Barley grass was good for a couple of months, but when in head it was a nuisance. The block then carried 60 head of stock. The lucerne was not topdressed—many farmers did not believe in it. The Shorthorn-cross cows were popular.

Since 1920 the lucerne on part of the block could be irrigated and with the advent of the new owner (Mr. Don Manson) some ten years ago, irrigated pasture was introduced and this brought increased production. Now the block has 42 acres of mixed pasture on carefully-graded land regularly irrigated, and an additional area of 20 acres ungraded.

Cows now number 93, and 86 have been milked at one time. This increased carrying is attributed to the pasture, and Mr. Marks considers that the limits of production are a long way off.

An interesting fact is that Mr. Marks has not lost a cow from bloat in three years. He maintains that widening the intervals between grazings to 21 days makes the pasture quite safe, but he hand feeds from April through the winter and does not stop in spring till the danger presented by early spring growth has passed.

# Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

### *Potatoes as a Stock Food*

POTATOES are the most nutritious root crop used as feed for stock. Most of the nutrients are obtained from the starch contained in them. Sugar beets which contain a good deal of sugar are the next most nutritious root fodder, and have been extensively grown in England and Europe during recent years to replace mangolds and turnips which contain only half the nutrients of sugar beets. Carrots are nearly as good for stock feed as sugar beets. Onions and pumpkins are very watery and rank with turnips and mangolds.

Normally roots are fed as a supplement to dry roughages and concentrates during the winter if stock are housed, and have no access to green feed, but they can be fed in large quantities to live stock under conditions like the present.

Sheep and cattle do well on potatoes, sugar beets and carrots, while pigs and poultry can be fed large quantities of boiled potatoes.

Roughly 2¼ lb. potatoes, 3 lb. sugar beets, 3½ lb. carrots, or 6 lb. pumpkins, onions, turnips, or mangolds have similar food values equal to 1 lb. good quality meadow hay. In comparison with good quality meadow hay at £7 per ton f.o.r. Melbourne, these fodders are valued as follows:—

| | | | | |
|---|---|---|---|---|
| Potatoes .. .. | £3 | 2 | 6 | per ton. |
| Sugar Beets .. .. | 2 | 5 | 0 | per ton. |
| Carrots .. .. | 2 | 0 | 0 | per ton. |
| Mangolds, turnips, onions, or pumpkins .. | 1 | 2 | 6 | per ton. |

Potatoes are an energy producing or fattening food, and, in this respect, 4 lb. of potatoes have the same food value as 1 lb. of grain, pollard, or the various concentrated foods. However, as with ground wheat, potatoes are deficient in protein, and for best results, and to balance the ration, lucerne hay or chaff, linseed meal or nuts, meat-meal or skim milk should be fed with potatoes.

The relative monetary values of potatoes and the fodders that they are likely to replace in the rations, based on the present wholesale price of pollard, are as follow:—

| | | | | |
|---|---|---|---|---|
| Pollard .. | £6 | 0 | 0 | per 2,000 lb. |
| Potatoes .. | 1 | 15 | 0 | per 2,240 lb. |
| Wheat .. | | 3 | 7 | per bushel. |
| Maize .. | | 3 | 7 | per bushel. |
| Oats .. .. | | 2 | 1 | per bushel. |
| Oaten Chaff .. | 4 | 2 | 0 | per 2,240 lb. |
| Meadow Hay .. | 3 | 10 | 0 | per 2,240 lb. |

Caution is necessary in feeding green potatoes and potato sprouts, as they may be poisonous to all classes of live stock. During storage feed potatoes should be well covered from light so that they will not "green". Sprouts should be removed before feeding.

### Potatoes for Pigs.

The potatoes should be boiled and fed in conjunction with grain or pollard and a protein supplement as follows:—

Feed to each pig ½ lb. of meat-meal, or ¾ gallon of separated milk, and 1½ to 2 lb. of ground grain or pollard per head daily, and as many boiled potatoes as it will eat. As the pig grows feed enough potatoes to satisfy its appetite.

### Potatoes for Sheep.

A complete maintenance ration for the average sheep would be supplied by 3¾ lb. of potatoes and ¼ lb. of linseed nuts daily, or 3 lb. of potatoes and ¾ lb. lucerne hay. However, these quantities may be reduced to one half, one quarter, or even less, depending upon the nature and quantity of paddock feed. Sheep can be maintained on potatoes for long periods without the linseed nuts or lucerne hay, and as some sheep pickings are usually available even on the barest-looking pastures, it is seldom necessary to feed the full amount mentioned.

### Potatoes for Cattle.

Dry cattle should be fed similar rations to sheep, but each animal will require five times the quantity fed each sheep.

Milking cows will require additional food containing more protein for milk production, and to maintain milk yields, 4 lb. of meat-meal, 16 lb. of linseed meal, or 50 lb. of lucerne chaff should be given with every 100 lb. of potatoes fed.

To prevent any risk from choking, potatoes should be sliced or crushed before they are fed to cattle, but in practice it is found that once cattle become accustomed to feeding on potatoes there is little or no danger.

### Potatoes for Poultry.

Cooked potatoes may be used in the poultry mash. Quantities sufficient for 500 birds are set out hereunder:—

| | |
|---|---|
| Potatoes .. .. .. | 50 lb. |
| Pollard .. .. .. | 30 lb. |
| Bran .. .. .. | 15 lb. |
| Meat-meal .. .. .. | 5 lb. |

## *"What Sort of Cow do We Want?"*

"Cattle at the Cross Roads," is the title of a booklet published recently in England by Littlebury and Company Ltd., the Worcester Press, Worcester. It contains the subject matter of a number of discussions on cattle breeding from a series broadcast by the British Broadcasting Corporation.

The speakers in the first discussion were W. S. Mansfield, M.A., Director of Cambridge University Farm, C. E. Harvey, a Friesian breeder of Thorpe, Northants, and Hugh Wyllie, an Ayrshire breeder of Rush Court, Wallingford. The subject was "What sort of a cow do we want?" and it was suggested that milk and beef could be produced in any of three ways—

(*a*) By having two distinct types of animal—milk and beef.

(*b*) By having a dual-purpose breed whose steer calves could profitably be reared for beef purposes.

(*c*) By having dairy breeds and mating the indifferent milkers in the herd with beef bulls.

In considering the first method it was argued that unless the price of beef was high it would not be profitable except on the poorer land to keep a beef type cow for twelve months for the sake of one weaned calf.

The advocate of the dual-purpose breed conceded that it was not possible to expect beef as well as milk from herds which were averaging about 1,200 gallons of milk per cow, but he insisted that dairymen who would be content with yields of 800 to 900 gallons could incorporate a certain amount of beef in addition. The third speaker however felt that if the skill required by the average farmer to raise his standard to 750 gallons (the average in Britain is thought to be about 450 gallons) with dual-purpose cattle were applied to a dairy breed it would probably raise the average to well over 1,000 gallons and that it would be a better economic proposition for a man to produce his 1,000 or 1,100 gallons and cross a proportion of his dairy cows with beef bulls. This policy was opposed on the grounds that the herds of dairy farmers who mated their worst milkers to a beef bull would cease to become self-supporting and that there would soon be a grave shortage of dairy heifers in the country. It was admitted that this practice could be followed to some degree if the average herd life of a dairy cow was six years instead of three years which is the average at the present time.

The speakers while not agreeing altogether on the subject of dual-purpose versus single-purpose cattle were unanimous in condemning "no-purpose" cattle of which it was thought there were too many. They also agreed that the cow must suit both the farmer and the farm, realizing that all farmers would not be able to manage high-yielding cows and that many farms owing to the poverty of the land and the climate would be unsuitable for cows with a high-yielding capacity.

Although the discussion deals with British breeds of cattle under British conditions "What sort of cow do we want?" provides much information applicable to this country. Dairying and beef breeds together with dual-purpose breeds all have a place in the Victorian live stock industry but maximum efficiency can only be attained by raising and maintaining the standard of herds and using the type of cattle suited to local conditions.

[J. T. Kelly, B.Agr.Sc., Science Field Officer.]

### *Weight for Age Baconers*

On one day last month there came to the notice of the writer two records of weight for age in baconers, comparison of which shows the need for keeping records of pig production.

In one instance, the record concerned a line of baconers which had just been sold. They had an average carcass weight of 185 lb., so that their live weight would have been in the vicinity of 250 lb. at the farm. These pigs were ten months old.

The other case was a line of baconers nearly ready for marketing. They were weighed weekly during their last few weeks on the farm, and when seven months old averaged 212 lb. alive, having gained an average of 11 lb. each during the previous week. The weight for age of these pigs is by no means an outstanding performance, but it does serve for comparison with the ten months old, 250 lb. pigs.

The important point of this story is that through having kept records of his pigs' ages and weights and then compared them with other performances, the owner of the ten months old pigs made enquiries, and is now taking action which should help him to produce pigs of the same weight in two to three months less time with a substantial saving of food, equipment and labour.

Abnormally slow growth may be due to one or more of many factors, such as the use of small-type breeding stock, a diet inadequate in quantity and quality, and infection.

To reduce such waste in the pig industry, it is necessary for farmers to keep written records of birth dates, marketing dates, and weights of their pigs. If these records of performance are not at least equal to a standard weight for age of 1 lb. live weight for each day of age in heavy baconers, the reason should be sought, and if it is not obvious to the farmer, he may obtain the advice of the Department of Agriculture.

[L. A. Downey, H.D.A., Pig Expert.]

### *Turkey Feeding*

The feeding or turkeys differs but slightly from the feeding of fowls, so that the principles that apply to fowls apply equally well to turkeys.

Although, as in the case of chickens, it is not usual to feed the young turkey poults for the first 36 to 48 hours, they may be fed as soon as they will start to eat.

The first feed should consist of a good chick mixture, which can be given either as a dry or a wet mash. The usual custom is to have a dry mash always available, and to feed a wet mash twice a day. At the end of three weeks, the wet mash can be fed once a day. After the birds are a few days old, a little finely-chopped, tender green food should be added to the wet mash, and some may be fed separately.

As with chickens, the young turkeys should be allowed free range in fine sunny weather. It is important that they be kept dry, as they are very susceptible to wet conditions.

Skim milk may be used in mixing the mash, and also for drinking purposes. A little cracked grain also should be fed in the evenings, and at the end of six weeks feed whole wheat and oats, with cracked maize if available. An adequate supply of fresh green food, shell grit, and clean drinking water should be available to the birds right up to the time of marketing.

When the birds are allowed out on free range, with plenty of grass seeds and insect life available, the mash may be eliminated, and grain fed in the evening to encourage the birds to come back to the roosting quarters, and to supply additional food requirements.

Extra food should be fed to the birds for three or four weeks before marketing, to ensure that they are in prime condition.

Turkeys are very prone to disease, and strict sanitary conditions are essential to success.

[H. F. Clinton, Poultry Expert.]

### *Bee-keeping*

During the present month work in the apiary should be restricted to the reconditioning of spare hives and frames and general repair work. No good purpose will be served by opening the hive and disturbing the colony, now semi-dormant and formed into a compact mass for warmth. Hive covers should be examined and where necessary, steps should be taken to see that they are correctly fitted and made weatherproof. Advantage should be taken of a cold bleak day to turn over the earth directly in front of the hive entrance with the object of preventing an early growth of grass retarding the free ingress and egress of bees during showery weather.

[J. W. Thomlinson, Apiary Inspector.]

### *Botulism in Stock*

Where stock have access to fodder damaged by moisture or mice, or where a depraved appetite shown by bone and carcass-chewing and even eating manure develops, botulism may follow the ingestion of the botulinus toxin sometimes found in such material. Symptoms are—general lassitude, inability to eat and drink, loss of cud, slobbering of food, and unsteadiness of gait. The tongue muscles may be paralysed and the tongue may protrude from the mouth. The average case of botulism may linger from three to five days but in acute cases there is sudden paralysis and coma, death taking place in a few hours.

The Commonwealth Serum Laboratories prepare an economical vaccine warranted as a preventative for vaccination of stock as yet unaffected. Further details on the use of this vaccine may be obtained on application to the Department of Agriculture, Melbourne, C.2.

[G. Nicol, B.V.Sc., Veterinary Stock Inspector.]

# SAVE THE FORESTS CAMPAIGN

THE Save the Forests Campaign Council has supplied the following information on its community tree-planting project for this winter. The aim of the Council is to have half a million trees planted by volunteers on public reserves and by owners on private property. The trees available for planting are pines, cedars, oaks, fast-growing poplars, the large-leaved Catalpa or Indian Bean, and eucalypts.

For community tree-planting—by voluntary effort for public benefit either for shade, shelter, beautification or timber—the Victorian Government has agreed to provide the trees free and the freight free, provided the organizations undertaking planting are approved by the local municipal council and the Forests Commission. This is to ensure competent planting and maintenance of the trees.

District Committees have been formed in the municipalities of Ararat, Ballarat, Beechworth, Benalla, Broadford, Fern Tree Gully, Glenelg, Maldon, South Gippsland, Stawell, Wangaratta, Oxley, Warragul and Woorayl. Progress associations, riding committees and similar organizations have promised co-operation in Euroa, Hamilton, Hampden, Phillip Island, Tungamah and Yea. Committees are in process of formation in many other places. The Campaign Council believes that the formation of similar committees in every municipality undertaking community tree-planting work will facilitate the successful organization and completion of a community tree-planting project.

The important stages in such a project are:— The formation of a committee; the selection of planting sites; planning the layout; the selection of suitable species of trees to plant; the ordering of the trees. When this stage has been reached, the fencing of the area—if necessary—and the organization of the necessary team-work to dig the holes and plant the trees are the final parts of the preparations.

If a District Committee is in existence, all applications for trees for community tree-planting purposes should be made through it. The trees are being supplied from the Forests Commission's nurseries and to reduce packing, handling and freight and to conserve manpower, all trees for the one centre will be despatched at the same time to one consignee who will arrange for their distribution.

Owners of private property will have to pay for trees supplied for their use and the Secretary Forests Commission, Melbourne, C.2, will supply full details to such owners. All enquiries regarding community planting can be made to either the District Committee, the local municipal council or to the Hon. Secretary, Save the Forests Campaign, 314 Collins-street, Melbourne, C.1.

# MARKING OF LAMBS

## *Precautions to be Observed*

By A. R. GRAYSON, B.V.Sc., Veterinary Officer

SHEEP farming is becoming, each year, more definitely a business undertaking. Competition, not only between individual breeders and countries, but also against artificial substitutes, is increasing and the position has been reached where each breeder must consider conducting every operation connected with his business along the most practical and scientific lines so as to minimize loss and wastage.

Consequently, the question of lamb marking, and the precautions that must be taken to ensure the successful carrying out of that operation, must receive the serious consideration of each individual sheep breeder. It is quite obvious that much of the success of sheep farming depends on the percentage of lambs reared, and it is still more obvious that, when a high percentage drop of lambs is at all appreciably reduced as a result of marking, much of the year's profit has disappeared.

Lamb marking consists of three operations—ear marking or tagging, castration and tail-docking. These operations are usually performed in the order mentioned and at the one handling. In this article, however, it is proposed to deal only with castration and docking.

### *Age and Time for Marking*

Any strong lamb could be marked with safety after it is a few days old. In practice, however, lambs are marked, according to the drop, at any time when they are between one and four weeks of age. The time of the year at which the operation is performed is solely dependent on the time at which lambs are dropped, varying in different districts and States.

The operation should be carried out during a period of mild weather. Weather that is wet and cold, particularly if there is a bleak wind, should be avoided, as should also hot sultry weather when there would be a greater possibility of "fly strike" occurring. Even in mild weather, the operation should be performed only in the morning and early afternoon and not continued on until evening, otherwise there is a possibility that some lambs will not be "mothered" before night. These lambs which do not find their mothers in all probability will die.

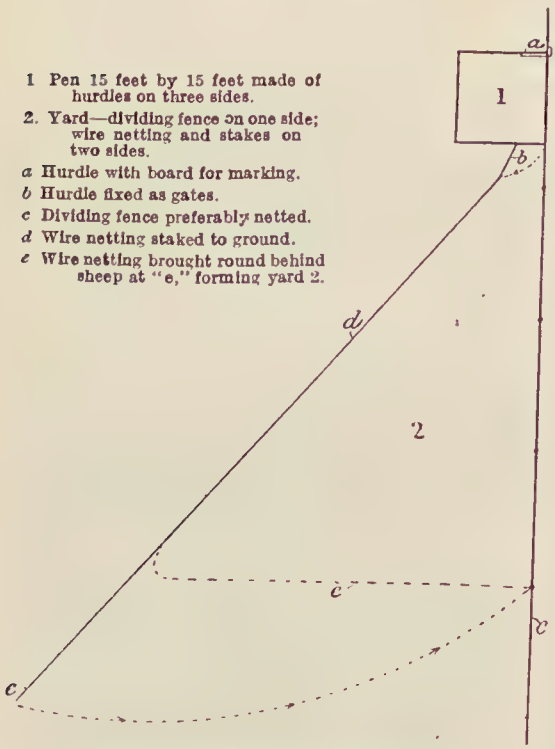
### *Site for Operation*

Temporary pens and yards erected out in the paddocks, where the ewes and lambs are running, form the ideal site. The lambs after the operation are then placed directly on to the fresh clean pasture and not on to the dry dusty ground, soiled by manure accumulations, which so often surround old permanent yards. This naturally minimizes the risk of wound contamination. Further, if the operations are carried out actually in the paddock in which the sheep are living, the lambs do not become hot and tired in being driven to the yards, and after the operation they find their mothers and settle down much more quickly.

Lamb marking in the open paddock away from permanent yards.

Such temporary yards and pens, for a small flock, can be constructed with little trouble simply by using hurdles, wire netting, and stout stakes. For large flocks, the construction of the yards may have to be more elaborate and difficulties may be created, but the advantages gained would more than outweigh the trouble involved. The yards should be dismantled after the job is finished and a fresh piece of ground selected as a site the following year.

The accompanying sketch forms a plan suitable for temporary yards for a flock of 250 ewes and their lambs.


1 Pen 15 feet by 15 feet made of hurdles on three sides.
2. Yard—dividing fence on one side; wire netting and stakes on two sides.
a Hurdle with board for marking.
b Hurdle fixed as gates.
c Dividing fence preferably netted.
d Wire netting staked to ground.
e Wire netting brought round behind sheep at "e," forming yard 2.
1
2
a
b
c
d
e

Temporary yard for marking lambs.

Will hold 250 ewes and their lambs—scale 1 inch equals 35 feet.

The ewes and lambs are driven into Yard 2 and the netting fence closed behind them at *e*. The Yard 1 is used as a catching pen and the operator stands at *a*. At this point, a smooth clean piece of new board, such as a 6-in. flooring board, should be nailed to the rail or hurdle and used as an operating platform. This board should be kept clean during the course of the operations by scrubbing it with a solution of washing soda in hot water, and a new board should be used each season.

Where the erection of temporary yards is no practicable and permanent yards are used fo lamb marking, every precaution must be take to make them as clean as possible, and conse quently as safe as possible. All manure an refuse must be gathered and carted away to safe distance. The yards should be well watere to prevent dust rising. If possible, the sit of the operation should be selected so that th lambs may be dropped, after marking, on t clean grass and not into a yard. The rails, &c. adjacent to this site should be thoroughly dis infected and a fresh surface prepared with a adze, &c.

### *The Operation*

Various methods, differing somewhat in the technique, are employed in the actual castration of lambs. It is not proposed here to enter into any discussion of the relative merits of any of them.

The object of the operation is to remove or destroy the testicles of the male lambs. Where removal is practised it must ever be borne in mind that the risk of infection, either during the operation or afterwards, is always present. The whole aim should be to lessen this risk, and it is to this end that the use of temporary yards on fresh pasture and the clean operating table have been advised. These are, however, in themselves, not sufficient. It is essential that all instruments must not only be sterile at the start of operations but also should be kept as far as possible in a sterile condition.

### *Sterilization of Instruments*

Knives should be wholly metal and preferably not hinged so that they can be effectively sterilized. The best and surest method of sterilizing all instruments is to boil them for ten to fifteen minutes in water, and all instruments other than knives should be so treated. Continual boiling affects the cutting edge of a knife, so that, after sharpening and cleaning, it should be put into a dish containing methylated spirits. The knife, when not in actual use, should be kept in the spirits. There should also be at hand a shallow flat dish containing a solution of 1 teaspoonful of lysol to 1 pint of water in which all other instruments are kept when not in actual use. The clothes, not only of the operator, but also of the catchers should be as clean as practicable.

If by any mischance an instrument should be dropped or become otherwise soiled by dirt it should be re-boiled. The operator should have water, soap, antiseptic, and a nail brush always handy for washing his hands, and he

should not attempt to assist in any other work. It is worth noting that when, as is so often the case, the lambs at marking time are also being inoculated against entero-toxaemia, this inoculation should never be performed by the marking operator but by another man who can personally maintain sterility of the syringe, &c.

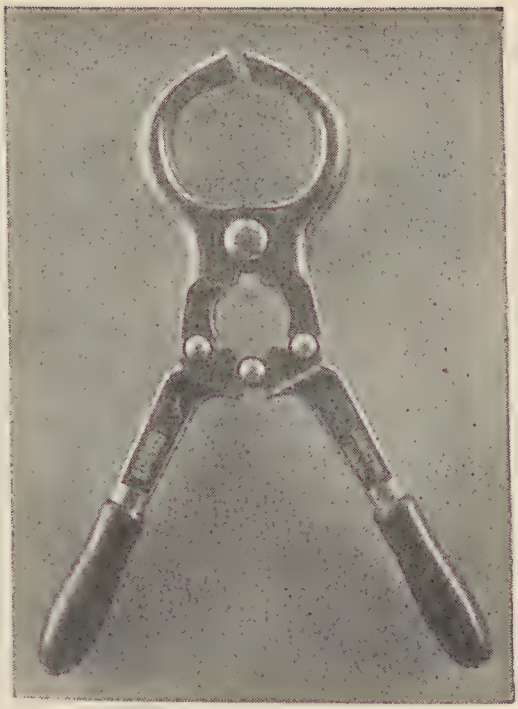
Some further points should be borne in mind while marking lambs. Lambs must be handled as gently as is possible. The catcher and/or holder should sit the lamb on the board, taking care not to unduly strain the lamb by pulling the legs too far apart. The cutting off of the end of the scrotum is preferable to slitting it, as by the former method better drainage is obtained, and blood clots will not be retained to act as media for the development of germs. After the operation the lamb should be dropped gently on to its feet on the grass.

### *The Bloodless Emasculator*

Coming into much greater favour and general use for marking lambs is the bloodless emasculator. The efficacy of this instrument depends on its being jointed in such a way that great pressure is exerted at its jaws by the application of a comparativly small force at its handles. The jaws are made so heavily and strongly that no pressure is lost by the springing of the jaws, which are also wide, rounded transversely on the edges, and smooth.

The edges of the jaws come together so intimately when the instrument is closed that any tissue interposed between them is completely crushed. Precision in their use is necessary. It is better to crush each spermatic cord separately, and in older animals to crush each cord twice. No after treatment is necessary. The testicles and scrotum are swollen for a few days but the lamb exhibits no systemic disturbance. The swelling soon disappears and the testicles become atrophied.

As mentioned before, precision in use is necessary. An explanation of the incomplete success in a small percentage of cases is that the cords were improperly held and so were not completely crushed. There is a tendency for them to roll away from the jaws of the instrument unless properly held. The big advantage gained by the use of this instrument is that there is no external wound. This should prove invaluable in fly-infested districts or on properties known to be infested with tetanus or blood poisoning germs.



The bloodless emasculator

Some flock owners who have had experience in the use of this instrument state that lambs marked in this way thrive better than lambs marked in the usual way. This, they ascribe to the facts that there are no external wounds to heal and that the lambs receive less shock.

In castrating older lambs, the use of the emasculator, either the bloodless or the ordinary one, is recommended. It is worth noting also that castration of adult sheep is looked upon as a most unsatisfactory operation with a high mortality rate no matter what method is adopted.

### *Tail Docking*

In docking the tails of lambs, the same precautions, with respect to the instruments used, are necessary. There has been a considerable difference of opinion as to the length of tail it is desirable to leave. Recent work on blowfly strike control shows that a "four joint" tail allows extra tail movement and so affords additional protection against fly strike. A "four joint" tail is one, which, in ewe lambs, is sufficiently long to cover the tip of the vulva, and this is the length, which it is advised, should be left after docking.

Before the tail is actually cut, the skin of the under surface should be retracted slightly towards the lamb's body by the man holding the lamb. When released it projects over the end of the bone protecting it while healing takes place. Docking of the tail in lambs is often effected by a cautery or searing iron shaped in the form of a spade. By this means haemorrhage is prevented and a barrier is raised against invasion by virulent bacteria.

The operation of tail docking can also be carried out using the bloodless emasculator. As a general rule, better results are obtained using this instrument on younger lambs. The jaws of the instrument are brought together at the required position and the bone is crushed. It is then necessary to run the knife round the inside curve of the jaws to completely sever the tail; the edges of the skin then remain together.

With strong well-developed lambs it is essential that the tail should not be docked too short with this instrument, as in such cases necrosis or death of the crushed bone and consequent sloughing of the tail up to the next joint almost invariably follows. With such well-developed lambs, i.e., stud lambs being kept with the idea of showing, it is preferable to use the knife and cautery.

If the process of marking is carried out in a clean manner as outlined and the lambs placed on a clean pasture afterwards no dressings are necessary. The use of sticky dressings which hold dust, dirt, and consequently germs can be harmful.

### *Infection of Wounds*

By far the most common cause of death as a result of wound infection following marking of lambs is tetanus which is caused by *Bacillus tetani*. This germ forms spores and it is the spore which contaminates the wound. These spores are very resistant to destruction and can live in soil and manure for a very long time. Infection of wound results in a rapid multiplication of tetanus bacilli and the liberation of toxin. This toxin does not give rise to a blood poisoning but affects the nervous system almost invariably with fatal results.

The symptoms of tetanus are shown in from two to fourteen days after infection and are, as follows:—The lamb becomes stiff in one or more legs—usually the hind ones—and while it can walk it shuffles along with more or less straight legs. If handled it will be noticed that the body is also stiff and the muscles of the back and loins are hard and contracted. Later, the lamb goes down and lies on its side in a typical attitude—with the legs extended and the head and neck drawn back. There are present characteristic muscular spasms and the membrane of the eye is drawn over the eyeball. Tympanitis or bloat is also present. Carcasses of lambs dead from tetanus should be destroyed by burning.

Losses are also brought about by blood poisoning. Several different kinds of organism can cause this complaint, but with each, death occurs rapidly. The main point for notice is the fact, that, like the tetanus spore, these germs which cause blood poisoning, are also found in manure dust and soil.

In other cases, infection of wounds can result in conditions such as joint infection which, while possibly not resulting in the death of the lamb can result in a serious economic loss due to unthrifty lambs.

### *Summary of Precautions*

Wherever possible use temporary yards on clean pasture. If permanent yards are used, thoroughly clean them prior to use.

Keep the marking board clean.

Sterilize hands and instruments before use and frequently during the operations.

Drop the lambs on to clean pasture and treat them gently.

The correct use of the bloodless emasculator is recommended.

Some of these points may seem trivial, but it must be remembered that the saving of only a few lambs each year will more than repay the breeder for any trouble that may be taken before and during the operation of lamb marking.

# Use and Control of Water

## *Competition at Cobram*

By HAROLD HANSLOW, Commissioner, State Rivers and Water Supply Commission

IF Australia is to be developed to her full agricultural capacity, maximum conservation, storage, and distribution of water supplies are essential. Victoria has recognized this fact and has constructed 35 large and hundreds of smaller reservoirs, sufficient to hold nearly 2,000,000 acre-feet of water, and 13,000 miles of irrigation channels commanding 3,400 square miles for irrigation. Further construction includes domestic and stock supply channels supplying 20,000 square miles, 2,115 miles of drainage channels, and 1,000 miles of pipe-lines supplying the Mornington and Otway Districts, and 258 towns. The capital expenditure on these works has been £30,000,000 but, notwithstanding this expenditure, post-war plans are being made for further development to the extent of an additional £25,000,000.

The Murray Valley District, where distribution works are in the course of construction, is the latest to be included in the Commission's area. The portion already in operation is from a point about 9 miles west of Yarrawonga to 9 miles west of Cobram; the proposed district will extend to Picola, and when completed will embrace approximately 300,000 acres. This area is one of the finest blocks of first-class agricultural land in Victoria. Its contour lends itself well to irrigation, and the land was originally timbered with box and Murray pine, the latter generally being an indication of good irrigable land. The principal industries prior to irrigation were wheat and sheep.

The Yarrawonga weir was constructed in 1939 to divert water to the district, and also to New South Wales at Mulwala. The pool formed above the weir has a capacity of 95,000 acre-feet, and is called Lake Mulwala. The main diversion channels on both sides of the river are very large. In New South Wales 2,000 cubic feet per second can be diverted, and in Victoria, 1,000 cubic feet.

A temporary crossing erected at Cobram to enable wheat crops to be irrigated last spring.

It is most surprising in Victoria that although irrigation has been so successful there has always been considerable objection by landholders to its commencement. The Murray Valley was no exception to the rule, but a referendum held in the district was carried in favour of the area being constituted an Irrigation and Water Supply District.

The Commission has done everything in its power to make irrigation in this District a success. First of all, in conjunction with the Department of Agriculture and the Council for Scientific and Industrial Research a soil survey of the district was made. Field days were held at which lectures and practical demonstrations were given to educate the farmers in irrigation methods and culture. Surveyors were provided at cost to help farmers lay out their farms for irrigation.

Farmers have taken advantage of this aid and are laying out their farms on the right lines, but they and the Commission have been considerably retarded in their work by the wartime shortage of labour, superphosphate, and fencing material.

The necessity for careful and thorough preparation of land for irrigation cannot be too strongly stressed. This layout forms the basis for successful irrigated agriculture.

Last spring, although earthworks for many miles of channel extensions had been completed water could not be run therein because the concrete structures and road crossings had not been installed due to the shortage of manpower. Crops were dying but, with the co-operation of the Shire Council and farmers, the Commission rushed in temporary pipe and sandbag structures and watered over 2,000 acres of crop. In this district also the Commission put in 950 acres of millet and Sudan grass to aid drought-stricken areas.

With the object of improving the standard of irrigation culture in its districts the Commission, for many years, has held farm, lucerne, and pasture competitions, and granted prizes of water to successful competitors. This year the Cobram Agricultural Society sponsored these competitions for the first time, and the writer had the pleasure of judging the farm with the best control of water.

If an irrigator is to be successful he must have complete control of the water on his farm, and it was pleasing, in this district, to note the absence of the mud-bank control so often seen in the older irrigation districts. Most of the entrants either had permanent structures or bag stops to control the water in the channel and a number had permanent outlets to the bays as well.

Most of the channels were free of weeds. These weeds develop and become more difficult every year of watering, particularly if water is left in the channels to provide drinking water for stock. This is a mistake for two reasons. The shallow water in summer becomes hot and unpalatable to stock, which do not drink as much as they should, and furthermore the warm water is very favorable to weed growth. After irrigation, the channels should be dried out as quickly as possible. It is a good idea to construct a small dam, about 10 yards square, in each paddock for stock water, but this dam should be close to the channel, and not at the bottom of the paddock where the water that drains off the paddock may be foul and the stock will not drink it as freely as they should. Stock will do much better if they have plenty of cool, clean water to drink, and not far to go for it. The earth from the banks of the dam is always useful to top up banks and effect repairs, &c.

It was noticeable at Cobram that irrigators were not making the mistake often seen in the older irrigation districts of making the doors in the channel stops too narrow, thus causing bottlenecks on one side and scours on the other.

One of the difficulties in the Cobram district is that the soil is inclined to "melt," the banks wash, and the land scour at the outlets. This might be corrected by having a wider cut to reduce the rush of water, or by pegging a piece of bag down to let water run over it.

First watering of a graded paddock

Another noticeable feature was the bareness of the channel banks and the land close to the banks where the drill wheels had run and nothing had been sown. Many of the check banks in the paddocks were bare also. If all this land were placed together in one piece it would represent quite a large area of valuable land not producing anything. Why is this so, and how can it be overcome? The fact of the matter is that nothing has been sown on the channel banks, and consequently nothing could be expected to grow there, but, if a heavy sowing by hand of perennial rye grass, lucerne, and superphosphate had been made when the channels were constructed, quite a lot of feed would be growing on the banks. This would do much to protect the banks from washing and trampling by stock, which prefer walking on bare places.

When check banks are put up with grader and crowder they mostly contain lumps, and are too loose for seed to take root in. In such cases it is advisable to roll and consolidate the banks before drilling. This can be done by rolling up one side of the bay with the end of the roller on the bank and then down the other side of the bay. When the end of the paddock has been reached the roller could be brought back the reverse way. A firm seedbed and a better strike will result from this operation. If there is no pea mite in the district better strikes will be obtained if the banks are sown down in the autumn.

The scale of points in the "Control of Water" Competition provides 10 points for records kept of watering. None of the competitors, however, had kept such a record. The Cobram Agricultural Society was wise in encouraging the keeping of records. Irrigators would find that such records could be made with a minimum of effort, and that the information gained from them would prove most useful and illuminating in future operations.

The bag stop in operation.

In the writer's opinion the amount of water used per watering by a number of irrigators seemed very heavy. If water is carried to the depth of the root zones of the plants, that should be sufficient. To use any more is to waste it. In irrigation areas of America

to-day the use of a soil probe is advocated. This probe is a piece of half-inch round pointed steel with a ring at the top to take a handle. The implement is pressed into the irrigated ground and the depth of the water soakage is determined by the ease of penetration. If too much water is being used it is advisable to increase the head or have a lesser number of outlets open at one time to rush the water over quicker or it may be necessary to modify the layout at a later date by shortening the length of bays if experience proves desirable. By this method time, water and money will be saved.

The water table in a large part of the Murray Valley district is at only 40 feet. By over-watering and leaving water in the channels a water table can be built up quickly. In Tongala thirty years ago water could not be obtained by boring. To-day at the butter factory water is being pumped from 44 feet, but the water table is about 32 feet. When irrigation was established at Tragowel the water table was about 25 feet; to-day in many places in that district it is within inches of the surface. In the Goulburn Irrigation System through dry seasons irrigators have, in seven years, been four times on rationed supplies and when supplies have had to be rationed no water has been made available for natural grass or ungraded lands. In all irrigation districts the State is carrying all head works and main channel costs. It has, therefore, every right to expect irrigators to make the best use of the water so that, by the indirect benefit, the extra production will repay the State. It appears that, before long, water will have to be refused, *even under water right,* for swamps, ungraded land and natural grass. In their own interest therefore irrigators should endeavour to learn to use water economically. There has been more damage done to irrigated lands and crop by over-watering than any other cause.

Irrigation channels should be made so that paddocks can be quickly watered and provision made to carry any surplus water to some lower place on the farm where grass such as paspalum and strawberry and sub. clovers grow.

There were only six entries in the Control of Water Competition but they were good entries. The winning farm belonged to Mrs. H. G. Johnson, who had constructed a big main channel through the property with cement checks and outlets up to Commission specifications. The distributory channels were not so good, but the entry was a very creditable one and 78 points were allotted to it. Mr. C. Dick was a very good second. He also had constructed a large main channel of ample capacity through his property, but his structures were not as good as Mrs. Johnson's and his distributory channels were similar. The main channel here was washing and showed the need of either beaching or planting with some vegetative cover at full supply level to prevent washing. Beaching would be very expensive and after considering everything the writer is of opinion that either ordinary rush or Paspalum dilatatum sods placed close together at midway between high water and ordinary water-level mark would be the better plan. Mr. Dick was given 77 points.

The first prize was 10 acre-feet of water. There were not sufficient entries for a second prize to be awarded.

## CONTOL OF WATER COMPETITION--COBRAM IRRIGATION DISTRICT.

### List of Awards.

| Name. | Layout. | Structures. | Cleanliness of Channels and Drains. | Drainage. | Provision for Stock Water. | Records of Watering. | Total. |
|---|---|---|---|---|---|---|---|
| Scale of points .. .. | 25 | 15 | 15 | 25 | 10 | 10 | 100 |
| Johnson, Mrs. H. G. .. .. | 22 | 14 | 14 | 18 | 10 | nil | 78 |
| Dick, C. .. .. .. | 22 | 12 | 13 | 20 | 10 | nil | 77 |
| Fleming, I. .. .. .. | 22 | 10 | 15 | 20 | 8 | nil | 75 |
| Bott N. C. .. .. .. | 20 | 12 | 12 | 20 | 10 | nil | 74 |
| Blythe, I. .. .. .. | 17 | 7 | 13 | 18 | 7 | nil | 62 |

# IN THE ORCHARD

## Attack Fruit Tree Pests in the Winter

Compiled by G. W. GAYFORD, B.Agr.Sc., Horticultural Instructor

WINTER spraying is essential for many of the pests to which fruit trees are subject. This work is frequently neglected and, as a result, there has been an increase of such pests as bryobia mite and green peach aphis on some orchards. For that reason, the following notes are supplied on control measures which may be applied effectively during the winter months for various insect pests.

### *Bryobia Mite*

When these mites infest an apple or pear tree in large numbers, they cause a yellowish, drought-stricken appearance of the leaves. The mites are tiny, eight-legged creatures usually found on the undersides of leaves. The eggs are reddish in colour and are thickly clustered on twigs and spurs.

For control, sprays of red oil, 1 in 15, or lime sulphur, 1 in 10, should be applied just before the buds open. These sprays are used to kill the eggs and therefore should be applied so that the undersides of twigs and spurs are thoroughly wetted.

### *San Jose Scale*

The San Jose scale infests deciduous trees of all sorts and is commonest in the northern orchard districts. Light infestations are sometimes difficult to detect because the scales are small, not much bigger than the head of a pin, and greyish in colour. They are circular with a raised centre. In serious infestations the scales overlap and produce a scurfy appearance on the bark of the trunk or limbs. When fruit is infested the scale is surrounded by a reddish ring. When scales are numerous the tree declines in vigour and some of the affected limbs may die.

The mixture recommended for the control of this scale is 2 gallons "winter white oil" and 5½ gallons lime sulphur in 72½ gallons of water. Make sure that the whole of the tree is thoroughly wetted by the spray.

### *Pear Leaf Blister Mite*

The Pear Leaf Blister mite is invisible to the naked eye. The damage consists of small raised blisters on the leaves of pear trees which at first are green in colour but later change to a reddish brown. Sometimes young developing fruits are also attacked. The mites spend the winter in the bud scales and infection is noticed as soon as the young leaves appear.

Control can be effected by a spray of lime sulphur, 1 in 10, before bud burst.

### *Green Peach Aphis*

The damage which the Green Peach aphis can cause in peach and nectarine trees is well known and can be very serious if winter spraying is neglected and cool weather in the spring favours an augmentation in numbers to plague proportions. The eggs of these insects are laid on twigs of peach and nectarine trees during the winter. In the spring they hatch out and the aphids attack the young leaves, causing them to curl up. When present in large numbers they prevent growth of laterals which may be killed.

The pest can be dealt with effectively in the egg stage by a spray of tar distillate, strength 1 in 35, or sprays containing D.N.C. at a strength of 1 in 40, applied before the middle of July. The unpleasant effects of these sprays on the operator may be overcome by smearing the face and hands with lanoline or paraffin jelly.

*Growers should make a sure job of this winter spray as it is probable that there will be a serious shortage of nicotine sulphate for control should an infestation occur in the spring.*

### *Black Cherry Aphis*

The Black Cherry aphis overwinters in the form of eggs close to the buds on the twigs of cherry trees. The effect of this insect on cherry trees is much the same as the effect of green peach aphis on peach trees. For control,

The effectiveness of the tar distillate spray may be clearly seen in the illustration. Left—Unsprayed, aphis-infested trees. Right—Sprayed, clean trees.

a tar distillate spray, strength 1 in 50, should be applied during the winter before the first week in July.

### *Woolly Aphis*

On some orchards in cooler locations the parasitic wasp has failed to control the woolly aphis pest of apple trees. Where it has increased in large numbers during the autumn, a spray of red oil, 1 in 15, should be used during the winter. In spraying, hold the nozzle close to the aphis colonies in order that the spray will penetrate the woolly covering of the insects.

### *Codling Moth*

The winter months offer an opportunity of ridding the orchard of the overwintering grub population. Advice to scrape the loose bark from trunks and limbs of trees was never given more often and heeded less than during the past few years. Old trees are notoriously difficult to keep free of codling moth, largely as a result of the numerous hiding places for overwintering grubs. A clean up of trees every three years would remove harbours for grubs and make control during the summer a much simpler matter. The efficiency of chemical or bag bands is increased by the removal of alternative cover. Cases and props should be dipped in boiling washing-soda solution at a strength of 1 lb. in 20 gallons of water, or alternatively these articles could be stacked in the packing shed, which should be mothproofed.

# THE FLOWER GARDEN

By J. L. Provan, B.Agr.Sc., Principal, School of Horticulture, Burnley Gardens

### *Shrubs*

NO garden is complete without well chosen and well placed shrubs. The shrubs may be selected for their flowers; their foliage, whether light-green, dark-green, or variegated; for their fruit and fragrance, and autumn colouring. Some shrubs are evergreen, others are deciduous, and suitable shrubs for practically every situation in the garden can be found. Some shrubs are particularly suitable for the small garden and for the gardener who cannot spare a great deal of time in maintaining the garden.

In choosing shrubs one should also bear in mind their form or habit of growth; some grow erect, others have a pendulous habit, while others are densely bushy and rounded in form. Some gardeners make the mistake of choosing a shrub for one particular pleasing feature, and fail to realize that this shrub may not suit the situation in which it is planted, or harmonize with the other shrubs around it. In the fairly large garden a succession of interest can be maintained practically throughout the year by careful selection of suitable shrubs.

In height shrubs range from prostrate ones, which can be planted to spread over small objects on the ground, such as stones, to the slightly larger ones useful for the front of the border, graduating up to tall shrubs to hide fences and to form a background for annuals and perennials.

### *Planting*

Having chosen the shrub and decided upon its correct position in the garden, both as regards the shrub's requirements and the

surrounding features, the actual planting operation must then be undertaken. The planting will depend upon how the shrub is purchased—whether it is in a flower pot, whether balled, such as with most azaleas and rhododendrons, or whether it is bare rooted.

The usual practice is for evergreen shrubs to be sold in pots or as balled plants. This is done because the root system must remain active during the winter to supply moisture to the leaves. Provided the shrub in a pot is not badly pot-bound, it can be transplanted without disturbing the root system. Simply invert the pot on your hand, knock the edge of the flower pot on something solid and the plant and soil will come out cleanly on your hand. Place in a prepared hole, planting about the same depth as the plant was in the pot. It is a mistake to prepare large deep holes for planting small shrubs. Such holes, dug in rather retentive soils, frequently become basins which hold stagnant water, and lead to the rotting of the root system. A much better practice is to dig over the whole bed in which the shrubs are to be planted, at the same time adding to the soil a generous supply of well-decayed compost or old manure.

The elaborate preparations sometimes made by keen gardeners are often due to their impatience to obtain rather more growth than the plant is capable of. If a shrub does not make rapid growth at first there is no cause to despair, because it may be developing a strong root system, and when this is developed stronger growth will take place.

In planting balled plants or plants from a pot in sandy soil, there is a danger that the water applied subsequently may not soak into the roots of the plant. To prevent this, the surface of the soil in which the roots of the plant are growing can be slightly broken up so that water will soak into the ball of soil. Usually very young plants, say one or two years old, transplant more easily than old plants because their root system has not been so much reduced in the transplanting operation.

Deciduous shrubs may be planted as bare-rooted plants. Care must be taken not to allow the root system to dry out before planting, and a precaution is to stand the plants in water overnight before planting.

The time of planting is important for some shrubs which are tender or half-hardy, that is, shrubs which cannot withstand severe frosts. Planting of these shrubs should be delayed until September, when the danger of severe frost is practically past. The hardy types of shrubs can be planted during the winter, or if purchased in a flower pot, they may be transplanted at any time of the year, provided that particular care is shown in watering them.

## *THE VEGETABLE GARDEN*

### *Peas*

Before sowing peas give the soil an application of lime or wood ashes, at the rate of 4-6 oz. per square yard. At this time of the year heavy soils are not suitable for

The Flowering Cherry (*Prunus Cerasus*).

peas. Better results will be obtained if the peas are sown in lighter, warmer types of soil which are well-drained.

Superphosphate applied at the rate of 2 oz. to the square yard when preparing the bed will be beneficial. It is not advisable to put this fertilizer in contact with the seed. Seed may be sown in rows 18 inches apart with about 2 to 3 inches between the plants, and should be covered by at least 1½ inch of soil.

Suitable varieties are *English Wonder* and *Melbourne Market*. Nitrogenous manures should not be applied at this time of the year, but increases in yields of peas have been noted by an application of sulphate of ammonia or nitrate of soda, at the rate of 1 oz. per square yard, when the plants are in flower.

Pea seed germination is sometimes very erratic, and various copper-containing dusts have been used for dusting the seeds prior to planting. These dusts have increased the germination of poor seed, but have had little effect when good seed is used. Copper carbonate at the rate of 2 oz. per bushel can be dusted over the seeds. This amount is equivalent to about one level teaspoonful per pound of seed.

### *Onions*

When planting out onions, choose garden beds known to be fairly free from weeds. The onion is a surface-rooting crop and weed competition severely checks its growth. Weeding in the onion beds must be done while the weeds are still small, so as not to disturb the shallow roots of the onion.

Seed of *Victorian Brown, Brown Spanish* and *White Imperial Spanish* onions may be sown this month in drills, in the permanent beds where they will remain. Space the rows about 10 inches apart and cover the seed to a depth of about ½ inch.

If clean, washed sand is used to cover the seed, weeding between the young seedlings will be reduced to a minimum. As soon as the plants are large enough they should be thinned 3 to 4 inches apart.

### *Potatoes*

Seed potatoes should now be selected for planting. In frost-free localities or where the soil is sandy and warm, planting may commence in the latter part of June; otherwise late August or the beginning of September is quite early enough. Varieties most suitable for the home garden are Early Carman or Katahdin. If possible, it is better to obtain Government "certified" or "approved" seed, as this will reduce the risk of poor yields, which so often follow the use of seed purchased indiscriminately. Potatoes are subject to diseases causing degeneration and low yielding ability. "Certified" seed is the produce of crops selected for their quality and freedom from disease.

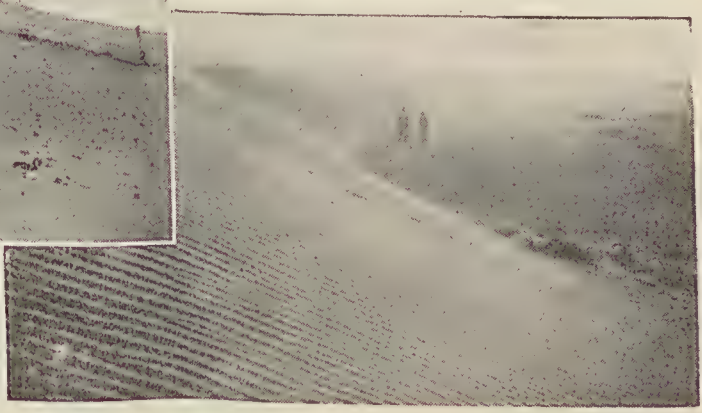
Seed for planting whole should be about 1½ to 2 oz. in weight; tubers larger than that may be split or cut into several pieces, according to size, just before planting. Each seed piece should have at least one good eye or shoot. Seed tubers should be spread out thinly in a light, airy, frost-free place to "green" and sprout. The potatoes are ready for planting when the shoots are about ¼ inch in length.

Where it is intended to plant potatoes, prepare the soil now by digging in well-decayed manure or compost and leaving the soil in a rough condition so that winter rains and frosts will mellow it down to a fine tilth. Do not apply lime to beds where it is intended to grow potatoes, as the potato prefers an acid soil. Furthermore, lime tends to increase the incidence of scab disease on the skin.

These usually develop first on the tops of the sand hills and are the danger signs that erosion has commenced. As indicated earlier these wind-blown patches act as focal points for erosion. They soon enlarge and if allowed to proceed unchecked the tops of the hills may become completely windswept and the surface soil removed for several feet. The lighter portion of the soil is blown away and the sand is blown over the flats, or in some cases it is piled as a loose sand dune over the side of the hill.

Most of the Mallee land devoted exclusively to grazing is located in the northern Mallee or the "marginal" districts, and much of it is held on annual lease. Under these conditions overgrazing is common and little, if any, attention is given to the matter of erosion prevention or cure.

This sand ridge has completely buried the fence which runs under the dune.



Sand dunes near Werrimul. The mist is due to sand and dust blowing along the surface.

It is probable that the marginal lands in the northern Mallee could best be used as controlled grazing units while in a condition to graze, but whenever and wherever the natural cover begins to deteriorate for any reason whatsoever, it will be necessary to cultivate and sow a crop to protect such lands from erosion. When sowing the crop every effort should be made to get the best germination possible, particularly on any patches on which erosion is already evident. On account of difficulties in sowing, there is a tendency to leave the windswept areas and drift banks without sowing any crop on them, but cover on these danger spots is an essential feature of erosion control. The crop sown should not be grazed before harvest as it is desired to get the maximum amount of stubble possible over the area. Grass, mustard, and other rubbish will develop among the stubble, and the area should then be safe for controlled grazing for some years. If these blocks are not treated when they commence to deteriorate they will continue to drift until erosion renders them of little use for any purpose and a source of trouble to adjacent lands and roads.

It has been found that ryecorn is a very useful plant for Mallee areas. It will thrive under more difficult conditions than other cereals, and is the outstanding plant for sowing on windswept sandhills and also on loose sandhills and dunes. Where the sandhill has been badly eroded it should, of course, be broken down and smoothed as far as practicable and cultivated to provide a suitable seedbed for the rye corn. If too much clay is exposed it may be necessary to plough this up very roughly, or put in a series of furrows so as to catch some sand on the area before it is sown. A seeding of about 50 lb. of ryecorn per acre, with superphosphate (when available) is recommended.

On loose sandhills, such plants as pyp-grass, marram grass, or blue lupins have been successfully grown in the better rainfall Mallee areas, particularly of South Australia and Western Australia. So far the experiments with sand-binding plants have not been very encouraging in the lower rainfall belts of Victoria, and although many different species of plants have been tested, none has proved as effective as ryecorn for stabilizing and reclaiming eroded sandhills.

### *Mallee Pastures*

The subjects of drift control and pastures are closely related in that land too light for

Sand hill denuded of top soil to a depth of several feet.

cultivation, and that retired from cultivation for a few years is best protected by vegetative cover. The pastures which develop naturally when cropped land in the Mallee is allowed to go out of cultivation are low in carrying capacity, and consist mostly of annual species with a short growing period. In general the amount of feed available is greatest during the first year or two out of cultivation, after which less edible species predominate. Periodical cultivation improves both the quantity and quality of the natural feed available on Mallee lands.

Large increases in the carrying capacity are required to justify much expenditure on seed and manure for sown pastures, and to be economically successful the sown pastures must be cheaply established, and produce superior or more feed than the natural pasture over a period of years. On account of the low rainfall the range of plant species which can be used for sown pastures in the Mallee is very limited, and even those species which can make reasonable growth in normal years can seldom withstand a drought. At the Mallee Research Station at Walpeup a great deal of experimental work has been carried out to test the suitability of a large number of grasses and shrubs for Mallee conditions. The cheapest forms of artificial pastures are probably sown cereal, or lucerne, Wimmera rye grass or Barrel Medick, where the seed of the pasture is sown with a cereal crop for grain.

Cereal crops such as oats, barley or rye corn sown for grazing can also be regarded as pasture. These necessitate a greater amount of cultivation than other types of pasture, but it is considered that cereal crops provide more feed, particularly early feed, than do natural or sown-down pastures in the Mallee. In addition, in favourable seasons, when all the feed available is not required, paddocks where cereals are growing may be closed up after one or two early grazings and later harvested as hay or grain, or possibly allowed to mature in the paddock to provide valuable grazing during the summer or autumn months. In the latter case some feed may be tramped into the ground where it will serve to provide seed for a self-sown crop in the next season.

### *Fodder Reserves*

The provision of adequate and well-protected fodder reserves on Mallee farms would do much to stabilize mixed farming in that area, and also be of assistance in reducing the amount of drift. Prior to the recent drought the number of sheep carried in the Mallee was greatly increased without adequate reserves of fodder to meet the position. In lean years

A close-up view of a Mallee sand dune.

Sheltered stable and yards at the Mallee Research Station.

starving stock will, if permitted, eat out all edible ground cover, and in their wanderings in search of feed, powder the surface soil so that it blows away more readily.

### *Trees and Shelter Belts*

One cannot leave the subject of soil drift and wind erosion without some reference to trees and shelter belts. Without its trees the Mallee would indeed be a desolate place, but it is considered that shelter belts are not an effective means of preventing drift over extensive cultivated areas. To be effective, wide belts of timber at frequent intervals would be necessary. Wide belts of timber are not necessarily the most effective wind breaks, but they are less likely to be covered or partially covered by drift sand.

Tests which have been made indicate that shelter belts are effective in reducing wind velocity on the lee side over an area of from five to twenty times the height of the trees in the belt. In dry years it is difficult to grow crops or grass within a chain or two on either side of a belt of trees in a low rainfall district.

The growing of trees and shrubs as a means of stabilizing the soil of some particular area, for example in the vicinity of a homestead or other building, or to prevent the soil drifting on to permanent improvements and public utilities and for the purposes of beautification, is in a different category from shelter belts for the general protection of cultivated fields. It cannot be too strongly emphasized that the growing or retention of existing trees and shrubs, particularly in dense clumps, for the former purposes is of great protective value and improves the living conditions within that area for both man and beast.

Sand dune burying Mallee scrub.

Rye corn sown on light land adjacent to a water channel.

When planting vegetative cover for protection it may be desirable that the trees or shrubs sown should be of some economical value as fodder, wood or timber. However, the tendency to use it for such purposes to the extent that the ground cover was rendered ineffective would need to be avoided.

It would seem that the planting of trees as seedlings on a wide scale in the Mallee is not economically possible, but it is probable that much could be achieved by the distribution in the soil of those trees and shrubs which originally grew on the particular area it was desired to revegitate. Such areas would need to be protected in the early stages from sand drift as well as from rabbits and stock. By sowing the seeds or seedlings amongst a good stubble of rye corn or wheat, the risk of damage to the young trees by sand drift or sand blast would be greatly reduced.

### *Boundary Control Methods*

Most of the control methods already outlined aim at preventing sand drift at its source. Of a different type are what may be termed boundary control methods, to prevent wind-blown sand encroaching on growing crops and essential services such as channels, roads, railways, fences, and buildings.

One of the commonest boundary control methods is to leave uncultivated strips of land or easements on the windward sideof the property to be protected. Where of sufficient width and covered with vegetation of any kind, such easements may be quite effective. Grass or weeds will catch a large volume of sand.

If all the surface cover on the easement is removed, for instance, by over-grazing, or burning as in the case of stubble, it becomes useless, for sand will blow for many chains over a smooth surface. Deep furrows on the easement will assist temporarily in trapping the sand, or crops may be sown for this purpose.

Brush fences are sometimes erected where protection is essential, and the Victorian Railways Department has erected a number of simple windchutes which deflect the wind through a narrow opening near the ground, thereby increasing its velocity sufficient to carry the drifting sand across the lines and deposit it on the other side. Loose sandhills adjacent to roads may be thatched with boughs or other cover to hold back the sand.

Boundary control methods are temporary expedients only. They offer no real solution of the drift-control problem, and their efficacy depends on the quantity of sand with which they have to contend. The most logical place to attack sand-drift is on the areas where it originates.

There is no one remedy or combination of remedies that will serve to control soil drift in all districts of the Mallee in every year, but the widespread application of fundamental principles of control will do much to minimize the evil.

# Standard Herd Records

## For Quarter ended 31st March, 1945

In the following are set out the records of all cows which completed a lactation during the quarter. The number is 384, of which 270 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies with the age class to which the animal belongs, the standard being as follows:—

| | |
|---|---|
| Junior 2-year old (under 2½ years at time of calving) .. .. | 230 lb. butter-fat. |
| Senior 2-year old (between 2½ and 3 years at time of calving) .. | 250 lb. butter-fat. |
| Junior 3-year old (between 3 and 3½ years at time of calving) .. | 270 lb. butter-fat. |
| Senior 3-year old (between 3½ and 4 years at time of calving) .. | 290 lb. butter-fat. |
| Junior 4-year old (between 4 and 4½ years at time of calving) .. | 310 lb. butter-fat. |
| Senior 4-year old (between 4½ and 5 years at time of calving) .. | 330 lb. butter-fat. |
| Mature cow 5 years and over .. .. .. .. .. | 350 lb. butter-fat. |

N.C.K. denotes no chart kept.

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk last day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Andrew, A., Whittlesea, Ayrshire (1).** | | | | | | | | | | |
| Rockleigh Emerald .. | Vol. 37 | 210 | 4 | 5,250 | 3·38 | 177·6 | 230 | Jr. 2 | .. .. | The Valley Boniface |
| **Atkinson, W. K., Swan Hill, Dairy Shorthorn (11).** | | | | | | | | | | |
| Willow Park Blush 23rd .. | 2329D | 273 | 19 | 8,159 | 3·47 | 283·1 | 230 | Jr. 2 | .. .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Camelia 44th | 2179B | 273 | 6½ | 7,260 | 2·89 | 209·7 | 270 | Jr. 3 | 213 .. | Willow Park Barrington 77th |
| Willow Park Comet 38th .. | 2256C | 273 | 7½ | 4,761 | 3·69 | 175·5 | 250 | Sr. 2 | .. .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Duchess 41st | 1525C | 273 | 18½ | 11,141 | 3·37 | 375·4 | 350 | Mature | 313, 294, 413 | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Duchess 48th | 1529C | 273 | 25 | 12,345 | 3·44 | 424·9 | 330 | Sr. 4 | 339, 371 .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Duchess 56th | 2339D | 273 | 11½ | 5,444 | 3·90 | 212·4 | 270 | Jr. 3 | 206 .. | Willow Park Imperial Cran 10th |
| Willow Park Duchess 62nd | 2343D | 273 | 15 | 5,617 | 3·90 | 218·8 | 230 | Jr. 2 | .. .. | Willow Park Barrington 77th |
| Willow Park Melba 35th .. | 1636D | 273 | 36 | 12,789 | 4·00 | 511·3 | 350 | Mature | 380, 420, 481 | Wicklesham Lord Barrington 5th (Imp.) |
| Willow Park Moss Rose 26th | 2347D | 273 | 29 | 10,503 | 3·22 | 338·7 | 270 | Jr. 3 | 275 .. | Wicklesham Lord Barrington 5th (Imp.) |
| Willow Park Rosebud 2nd | 1448A | 273 | 5 | 5,745 | 3·88 | 223·1 | 330 | Sr. 4 | 282, 296 .. | Wicklesham Lord Barrington 5th (Imp.) |
| Willow Park Rosebud 4th | 2163A | 273 | 7 | 4,731 | 3·66 | 173·1 | 230 | Jr. 2 | .. .. | Willow Park Royal Barrington |
| **Ballarat Orphanage, Ballarat, Jersey (6).** | | | | | | | | | | |
| Orphanage Attraction 8th | 54571 | 273 | 14 | 7,707 | 4·68 | 360·7 | 350 | Mature | 333, 331, 394, 438, 354, 484, 236 | Jerseylea Quality Boy |
| Orphanage Attractive 14th | 88369 | 273 | 20 | 8,538 | 5·01 | 427·9 | 290 | Sr. 3 | 328 .. | Orphanage Centaurus |
| Orphanage Melba 20th .. | 88372 | 273 | 18½ | 7,841 | 5·65 | 442·8 | 290 | Sr. 3 | 343 .. | Clarendon Eyre Oxford Observer |
| Orphanage Queen .. | Vol. 31 | 273 | 22 | 7,943 | 5·92 | 470·1 | 290 | Sr. 3 | .. .. | Banyule Monoplane |
| Orphanage Soprano .. | 83301 | 273 | 18 | 8,412 | 4·65 | 391·4 | 310 | Jr. 4 | 303 .. | Clarendon Eyre Lililite's Oxford 4th |
| Orphanage Silvermine 2nd | 88376 | 273 | 14½ | 5,706 | 5·84 | 333·1 | 270 | Jr. 3 | 246 .. | Banyule Bungana |
| **Banyule Stud, Wangaratta, Jersey (9).** | | | | | | | | | | |
| Banyule Hawthorn 21st .. | 56253 | 273 | 10½ | 9,233 | 4·62 | 426·8 | 350 | Mature | 449, 439, 606, 423, 377 | Banyule Oxford Don |
| Banyule Hawthorn 23rd .. | 75073 | 273 | 10 | 7,539 | 4·94 | 372·1 | 310 | Jr. 4 | 306, 339 .. | Tavistock Honesty's Prince 2nd |
| Banyule Hawthorn 24th .. | 85031 | 273 | 12 | 5,227 | 5·12 | 267·8 | 230 | Jr. 2 | .. .. | Banyule Bungana |
| Banyule Molly 68th .. | 85082 | 273 | 10 | 4,773 | 5·68 | 270·9 | 230 | Jr. 2 | .. .. | Banyule Silvius |
| Banyule Silvermine 124th | 65347 | 273 | 11½ | 7,364 | 5·38 | 396·5 | 350 | Mature | 523, 445, 431 | Banyule Comet |
| Banyule Silvermine 135th.. | 75074 | 273 | 17 | 7,013 | 5·32 | 273·3 | 330 | Sr. 4 | 398, 299 .. | Banyule Monoplane |
| Banyule Silvermine 144th | 85035 | 273 | 15½ | 6,472 | 4·93 | 318·8 | 230 | Jr. 2 | .. .. | Banyule Bungana |
| Banyule Silvermine 145th | 85086 | 250 | 4 | 5,650 | 4·69 | 265·2 | 230 | Jr. 2 | .. .. | Banyule Bungana |
| Banyule Tiddlewinks 26th | 56270 | 273 | 9 | 5,764 | 5·90 | 340·3 | 350 | Mature | 511, 461, 935 | Banyule Oxford Don |

| Name o Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Barkla, R. E., and Sons, Joyce's Creek, Jersey (3).** | | | | | | | | | | |
| Green Gully Dawn .. | 86648 | 273 | 10 | 4,065 | 5·20 | 211·5 | 330 | Sr. 4 | 187, 237 .. | Orphanage Major |
| Joyce's Creek Mercy .. | C.R. | 273 | 9 | 4,410 | 5·56 | 245·1 | 250 | Sr. 2 | .. .. | Joyce's Creek Thorn |
| Joyce's Creek Poppy .. | C.R. | 273 | 8 | 3,789 | 6·59 | 250·0 | 250 | Sr. 2 | .. .. | Orphanage Major |
| **Bennett, J. W., Yinnar, Jersey (5).** | | | | | | | | | | |
| Ellendale Bluebell 30th .. | Vol. 31 | 273 | N.C.K. | 5,741 | 5·83 | 334·5 | 230 | Jr. 2 | .. .. | Avalon Prince Madeira |
| Ellendale Duchess 2nd .. | 61417 | 273 | N.C.K. | 9,047 | 4·44 | 401·9 | 350 | Mature | 433, 346 .. | Staghorn Bellboy |
| Ellendale Duchess 5th .. | 76081 | 273 | N.C.K. | 6,669 | 5·73 | 382·3 | 350 | Mature | 458, 492, 435 | Avalon Prince Madeira |
| Ellendale Kirsty 26th .. | 66336 | 273 | N.C.K. | 9,537 | 4·84 | 461·3 | 350 | Mature | 378, 581, 486, 424 | Staghorn Bellboy |
| Ellendale Kirsty 45th .. | 86097 | 273 | N.C.K. | 6,953 | 5·01 | 348·6 | 310 | Jr. 4 | 427 .. | Staghorn Bellboy |
| **Bennett, R. H., Lancefield, Jersey (2).** | | | | | | | | | | |
| Edenhope Iris .. .. | 76034 | 273 | 14 | 8,048 | 6·42 | 516·9 | 350 | Mature | 324, 328, 394, 421 | Jindivick Defiance |
| Edenhope Northwood Madeira | 81130 | 273 | 14½ | 5,819 | 6·02 | 350·5 | 330 | Sr. 4 | 235 .. | Jindivick Defiance |
| **Black, Estate of the late I. S., Noorat, Ayrshire (4).** | | | | | | | | | | |
| Mount Noorat Gina .. | 35702 | 273 | 10 | 5,182 | 5·01 | 259·5 | 250 | Sr. 2 | .. .. | Sandhill Kipling (Imp.) |
| Mount Noorat Goodness .. | 36612 | 273 | 15 | 7,905 | 4·14 | 327·6 | 250 | Sr. 2 | .. .. | Sandhill Kipling (Imp.) |
| Mount Noorat Gracious .. | 36613 | 273 | 14 | 7,257 | 4·06 | 294·3 | 230 | Jr. 2 | .. .. | Sandhill Kipling (Imp.) |
| Mount Noorat Teshu Mai | 35704 | 273 | 15 | 6,242 | 4·55 | 284·3 | 270 | Jr. 3 | 210 .. | Sandhill Kipling (Imp.) |
| **Broad, Mrs. A. A., Sutton Grange, Jersey (3).** | | | | | | | | | | |
| Grangelea Bella .. .. | 81593 | 273 | 14 | 6,552 | 5·12 | 335·4 | 290 | Sr. 3 | 297 .. | Navua Wonderful Count |
| Grangelea Rebel .. .. | 71630 | 273 | 12 | 8,676 | 5·37 | 466·1 | 350 | Mature | 309, 471 .. | Grangelea Daffodil's Airo |
| Grangelea Ruby 3rd .. | 66766 | 273 | 13 | 7,111 | 4·74 | 337·2 | 350 | Mature | 328, 344, 291, 362 | Grangelea Cream Boy |
| **Broad, A. J., Pyramid, Jersey (1).** | | | | | | | | | | |
| Lynlea Rose Petal 3rd .. | 82555 | 273 | N.C.K. | 5,946 | 6·79 | 403·5 | 310 | Jr. 4 | 277, 320 .. | Grangelea Mac |
| **Bruhn, C. H., Mirboo North, Jersey (3).** | | | | | | | | | | |
| Eltekon Handsome Girl .. | Vol. 31 | 273 | N.C.K. | 7,359 | 5·15 | 379·1 | 250 | Sr. 2 | .. .. | Silverbrae Volunteer |
| Eltekon Miss Importance .. | C.R. | 273 | N.C.K. | 5,385 | 5·18 | 279·2 | 230 | Jr. 2 | .. .. | Werribee War Volunteer |
| Lumeah Cynthia .. | 87520 | 273 | N.C.K. | 7,063 | 5·66 | 400·0 | 350 | Mature | 398 .. | Hazelgrange Minnie's Master |
| **Butcher, F. T., Swan Hill, Red Poll (1).** | | | | | | | | | | |
| Maryville Flower .. | 9003A | 273 | 7½ | 4,568 | 3·87 | 177·0 | 230 | Jr. 2 | .. .. | Temperley Prism |
| **Candler, G. E., Hamilton, Ayrshire (1).** | | | | | | | | | | |
| Jennewar Sylvia 4th .. | 36457 | 273 | 26 | 7,983 | 4·08 | 325·6 | 230 | Jr. 2 | .. .. | Inverurie Lauchie |
| **Carne, W. J., Pakenham Upper, Jersey (1).** | | | | | | | | | | |
| Glencarne Bridal Song .. | 86405 | 273 | 21 | 7,760 | 4·49 | 348·9 | 270 | Jr. 3 | 254 .. | Brampton Noble Standard (Imp.) |
| **Chadderton, J. E., Hamilton, Jersey (8).** | | | | | | | | | | |
| Glen Leigh Damson .. | 76344 | 273 | 17½ | 6,176 | 4·75 | 293·4 | 290 | Sr. 3 | 309, 304 .. | Selsey Taxpayer |
| Glen Leigh Dancer .. | 76345 | 273 | 13½ | 6,134 | 5·77 | 354·0 | 290 | Sr. 3 | 247, 306 .. | Glen Leigh Volunteer |
| Glen Leigh Dawn 3rd .. | 57357 | 273 | 13 | 5,214 | 6·50 | 338·9 | 350 | Mature | 342, 344, 425, 391, 358 | Selsey Jupiter |
| Glen Leigh Dawn 5th .. | 81446 | 273 | 13 | 4,868 | 6·52 | 317·5 | 270 | Jr. 3 | 274 .. | Selsey Taxpayer |
| Glen Leigh Destiny 3rd .. | 61707 | 273 | 13½ | 5,654 | 5·80 | 327·7 | 350 | Mature | 329, 375, 360, 307, 312 | Selsey Jupiter |
| Glen Leigh Destiny 7th .. | 81448 | 273 | 16 | 6,123 | 5·78 | 353·7 | 290 | Sr. 3 | 338 .. | Selsey Taxpayer |
| Glen Leigh Diamond .. | 66575 | 273 | 13 | 7,044 | 4·47 | 315·1 | 350 | Mature | 279, 307, 353, 277 | Glen Leigh Volunteer |
| Glen Leigh Dolly 3rd .. | 52824 | 273 | 16 | 7,713 | 4·64 | 358·1 | 350 | Mature | 354, 272, 463, 421, 357 | Glen Leigh Bounty |
| **Chirnside, R. M., Whittlesea, Jersey (1).** | | | | | | | | | | |
| Mornmoot Northwood Madeira 17th | 87970 | 273 | 18 | 6,256 | 5·08 | 318·0 | 230 | Jr. 2 | .. .. | Navua Paxie's Volunteer |
| **Clarke, F. W., Toora, Jersey (5).** | | | | | | | | | | |
| Mer Vue Butterfly 3rd .. | 87795 | 273 | N.C.K. | 8,475 | 6·01 | 509·6 | 290 | Sr. 3 | 344 .. | Mer Vue Jupiter |
| Mer Vue Choice Soprano 7th | Vol. 31 | 273 | N.C.K. | 5,052 | 6·50 | 328·5 | 250 | Sr. 2 | .. .. | Mer Vue Jupiter |
| Mer Vue Choice Variety 2nd | 82778 | 273 | N.C.K. | 8,477 | 7·10 | 609·2 | 330 | Sr. 4 | 367, 512 .. | Mer Vue Jupiter |
| Mer Vue Choice Variety 4th | Vol. 31 | 210 (Died) | .. | 5,400 | 5·47 | 295·2 | 230 | Jr. 2 | .. .. | Mer Vue Renown |
| Mer Vue Sister .. .. | 58406 | 273 | N.C.K. | 12,403 | 5·59 | 693·7 | 350 | Mature | 469, 629, 662, 585 | Woorayl Flashlight |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Clark, P. W., and Son, Whittlesea, Jersey (3).** | | | | | | | | | | |
| Coodardy Aldan's Glorious | 75735 | 273 | 20½ | 9,062 | 5·84 | 529·3 | 350 | Mature | 456, 618, 525 | Staghorn Lord Aldan 3rd |
| Coodardy Centurions Liberty | 70829 | 273 | 15 | 8,382 | 4·62 | 387·2 | 350 | Mature | 413, 334, 547, 521 | Werribee Centurion |
| Toorongo Aldan's Jessie .. | C.R. | 273 | 22½ | 8,138 | 5·16 | 420·2 | 350 | Mature | 485 .. | Staghorn Lord Aldan 3rd |
| **Colenso, L. W., Alvie, Jersey (10).** | | | | | | | | | | |
| Normandie Alsyke 3rd .. | 68358 | 273 | 13 | 6,855 | 4·77 | 326·8 | 350 | Mature | 253, 354, 400, 423, 363 | Lewisham Playboy |
| Normandie Golden Nancy 3rd | 68359 | 273 | 12 | 6,429 | 6·40 | 411·5 | 350 | Mature | 383, 405, 557, 561, 476 | Normandie Majestic |
| Normandie Hawthorn 15th | 68361 | 273 | 18½ | 8,655 | 5·11 | 442·1 | 350 | Mature | 303, 360, 557, 588, 450 | Lewisham Playboy |
| Normandie Hawthorn 24th | 88271 | 273 | 15 | 5,585 | 5·03 | 280·7 | 250 | Sr. 2 | 261 .. | Normandie Majestic |
| Normandie Ilma 10th .. | 73203 | 273 | 18 | 7,862 | 4·61 | 362·3 | 350 | Mature | 206, 324, 378, 300 | Lewisham Playboy |
| Normandie Ilma 14th .. | 83190 | 273 | 17 | 6,083 | 4·80 | 292·1 | 290 | Sr. 3 | 287 .. | Normandie Majestic |
| Normandie Lady 4th .. | Vol. 31 | 273 | 17 | 5,952 | 4·69 | 279·1 | 230 | Jr. 2 | .. .. | Normandie Playboy |
| Normandie Primrose 9th .. | 88279 | 240 (Sold) | .. | 4,350 | 5·50 | 239·4 | 250 | Sr. 2 | 261 .. | Normandie Playboy |
| Normandie Primrose 10th | Vol. 31 | 273 | 12 | 4,692 | 4·65 | 218·4 | 230 | Jr. 2 | .. .. | Normandie Playboy |
| Normandie Thelma 8th .. | 78140 | 273 | 18 | 7,691 | 4·54 | 348·8 | 330 | Sr. 4 | 282, 362 .. | Normandie Playboy |
| **Cook, D. E., Loch, Jersey (2).** | | | | | | | | | | |
| Wattle Vale Barbara .. | Vol. 31 | 273 | N.C.K. | 4,043 | 5·50 | 222·2 | 250 | Sr. 2 | .. .. | Wattle Vale Limelight |
| Wattle Vale Marina .. | 59954 | 273 | N.C.K. | 3,920 | 5·86 | 229·7 | 350 | Mature | 337, 339, 262 | Wattle Vale Studmaster |
| **Coulthard, J. J., Whittlesea, Jersey (4).** | | | | | | | | | | |
| Walamba Bubbles 2nd .. | Vol. 31 | 273 | 14½ | 6,269 | 4·17 | 261·5 | 230 | Jr. 2 | .. .. | The Wattle's Gamboge 3rd |
| Walamba Lady .. .. | 64779 | 273 | 8 | 4,038 | 5·24 | 211·6 | 350 | Mature | 294, 274, 336, 422 | Banyule Airo |
| Walamba Lady Bluebell .. | C.R. | 240 | 4 | 3,480 | 5·12 | 178·1 | 290 | Sr. 3 | 200 .. | Airlie Don |
| Walamba Merry Queen .. | C.R. | 273 | 8 | 5,112 | 4·81 | 245·8 | 230 | Jr. 2 | .. .. | The Wattle's Gamboge 3rd |
| **Cowan, G. L. S., Bacchus Marsh, Friesian (3).** | | | | | | | | | | |
| Upper Lappan Audrie .. | C.R. | 273 | N.C.K. | 6,877 | 3·53 | 242·7 | 250 | Sr. 2 | .. .. | Upper Lappan Pontiac |
| Upper Lappan Romona 2nd | Vol. 15 | 273 | N.C.K. | 9,579 | 3·32 | 317·6 | 290 | Sr. 3 | 258 .. | Upper Lappan Pontiac |
| Upper Lappan Shepherdess | Vol. 15 | 273 | N.C.K. | 9,498 | 3·72 | 353·2 | 330 | Sr. 4 | 290, 321 | Upper Lappan Pontiac |
| **Cuddihy, T. D., Geelong, Jersey (3).** | | | | | | | | | | |
| Mount Violet Fairy Madeira | 72974 | 273 | N.C.K. | 4,915 | 4·47 | 219·8 | 350 | Mature | 352, 334, 248 | Mount Violet Madeira's Count |
| Pine Ridge Hawthorn 7th | 83471 | 273 | N.C.K. | 3,030 | 4·88 | 147·8 | 290 | Sr. 3 | 185, 232 .. | Belgonia Magnetic Chief |
| Pine Ridge Silvermine 9th | 83474 | 273 | N.C.K. | 2,232 | 5·58 | 124·5 | 290 | Sr. 3 | 179 .. | Belgonia Magnetic Chief |
| **Dennis, Mrs. A. A., Frankston, Jersey (2).** | | | | | | | | | | |
| Ballam Gay Ladybird .. | Vol. 31 | 273 | 31 | 8,208 | 5·53 | 454·3 | 230 | Jr. 2 | .. .. | Windrest Gadget's Achievement |
| Ballam Princess .. .. | 65288 | 273 | 18 | 7,173 | 5·21 | 373·7 | 350 | Mature | 358, 365, 522, 493 | The Wattle's Gamboge Prince |
| **Department of Agriculture, Werribee, Friesian (5).** | | | | | | | | | | |
| Victoria Dutch Domino .. | C.R. | 273 | N.C.K. | 8,310 | 4·20 | 348·9 | 250 | Sr. 2 | .. .. | Rupertswood Dutch Prince |
| Victoria Jostle .. .. | Vol. 15 | 273 | N.C.K. | 11,919 | 3·31 | 394·0 | 310 | Jr. 4 | 465 .. | Rupertswood Dutch Prince |
| Victoria Madeline .. | Vol. 15 | 273 | N.C.K. | 16,512 | 3·31 | 546·1 | 310 | Jr. 4 | 326, 465 .. | Victoria Conductor |
| Victoria Sonorous Piebe .. | 4289 | 273 | N.C.K. | 16,007 | 3·25 | 520·1 | 350 | Mature | 441, 418, 491, 583, 493, 493, 555, 521 | Victoria Topnote |
| Victoria Terbell .. .. | Vol. 15 | 210 (Sold) | .. | 7,995 | 3·04 | 242·9 | 250 | Sr. 2 | .. .. | Terling Hypothesis (Imp.) |
| **Department of Agriculture, Werribee, Red Poll (12).** | | | | | | | | | | |
| Victoria Albatross .. | 6707AA | 240 | .. | 7,575 | 4·88 | 369·7 | 350 | Mature | 249, 282, 374, 295, 370 | Chandpara Valentine |
| Victoria Bessie .. .. | 7009A | 273 | N.C.K. | 10,781 | 3·46 | 372·7 | 350 | Mature | 316, 339, 450, 283, 306 | Woodburn Peter Pan |
| Victoria Bluebird .. | Vol. 12 | 273 | N.C.K. | 7,058 | 4·81 | 339·2 | 350 | Mature | 340, 389, 357 | Woodburn Peter Pan |
| Victoria Demand .. | Vol. 12 | 273 | N.C.K. | 9,059 | 4·52 | 409·9 | 290 | Sr. 3 | 346 .. | Woodburn Peter Pan |
| Victoria Divide .. .. | C.R. | 273 | N.C.K. | 5,148 | 4·68 | 241·0 | 230 | Jr. 2 | .. .. | Woodburn Peter Pan |
| Victoria Electricity .. | Vol. 12 | 273 | N.C.K. | 10,358 | 4·25 | 440·0 | 330 | Sr. 4 | 365, 457 .. | Victoria Robin Hood |
| Victoria Maid Marion .. | 5690AA | 273 | N.C.K. | 9,258 | 4·40 | 407·1 | 350 | Mature | 316, 437, 445, 426, 349, 371, 314 | Woodburn Peter Pan |
| Victoria Maiden .. .. | 7584AA | 273 | N.C.K. | 8,151 | 4·43 | 361·3 | 350 | Mature | 325, 366 .. | Chandpara Valentine |
| Victoria Matrimony .. | Vol. 12 | 273 | N.C.K. | 6,294 | 4·26 | 268·3 | 350 | Mature | 287, 241, 290 | Woodburn Peter Pan |
| Victoria Petunia .. .. | Vol. 12 | 273 | N.C.K. | 8,185 | 5·10 | 417·2 | 290 | Sr. 3 | 352 .. | Burnwood Masterpiece |
| Victoria Phlora .. .. | 9159A | 273 | N.C.K. | 8,628 | 3·65 | 314·9 | 230 | Jr. 2 | .. .. | Burnwood Masterpiece |
| Victoria Skip .. .. | 7969A | 273 | N.C.K. | 6,917 | 3·82 | 263·9 | 330 | Sr. 4 | 290 .. | Chandpara Valentine |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Desmond, J. J., Rochester, Jersey (1).** | | | | | | | | | | |
| Macroom Fairy 4th .. | 77511 | 273 | 14¼ | 8,009 | 6·45 | 516·4 | 350 | Mature | 433 .. | Macroom Lassie's Mikado |
| **Devon Park Stud Farm (G. S. Daley), Lilydale, Jersey (3).** | | | | | | | | | | |
| Devon Park Royal Chance | Vol. 31 | 273 | 20 | 7,613 | 5·08 | 386·4 | 230 | Jr. 2 | .. .. | Karrara Eileen's Aim |
| Devon Park Standard Eileen 2nd | 85973 | 273 | 10 | 5,107 | 6·03 | 308·0 | 270 | Jr. 3 | 338 .. | Brampton Sporting Standard (Imp.) |
| Karrara Fancy Madeira .. | 67354 | 273 | 28 | 11,934 | 4·96 | 592·2 | 350 | Mature | 446, 652, 583, 613, 650 | Victorious Pioneer (Imp.) |
| **Dookie Agricultural College, Dookie, Ayrshire (6).** | | | | | | | | | | |
| Dookie Adorn .. .. | 32241 | 273 | N.C.K. | 10,255 | 3·80 | 390·1 | 350 | Mature | 324, 360, 387, 319 | Tregorland Indispensible |
| Dookie Dancer .. .. | 30380 | 273 | N.C.K. | 9,086 | 4·43 | 402·5 | 350 | Mature | 353, 360, 382, 385, 307 | Tregorland Indispensible |
| Dookie Hope .. .. | 33479 | 273 | N.C.K. | 8,069 | 4·28 | 345·4 | 350 | Mature | 292, 382, 347 | Tregorland Indispensible |
| Dookie Peace .. | Vol. 37 | 273 | N.C.K. | 6,448 | 3·83 | 247·1 | 230 | Jr. 2 | .. .. | Dookie Radiant |
| Dookie Peeress .. .. | Vol. 37 | 273 | N.C.K. | 7,145 | 4·54 | 324·5 | 230 | Jr. 2 | .. .. | Gowrie Park Bonnie Sailor |
| Dookie Peon .. .. | 34493 | 273 | N.C.K. | 9,244 | 4·00 | 369·9 | 350 | Mature | 303, 365 .. | Gowrie Park Bonnie Sailor |
| **Doyle, Dr. G., Arthur's Creek, Jersey (2).** | | | | | | | | | | |
| Maxmount Twinkle Star 2nd | 82695 | 120 | N.C.K. | 3,150 | 3·82 | 120·2 | 330 | Sr. 4 | 214 .. | Maxmount Pearl's Master |
| Streamville Gladdie .. | Vol. 31 | 273 | N.C.K. | 5,385 | 5·57 | 299·7 | 250 | Sr. 2 | 195 .. | Maxmount Pearl's Laddie |
| **Enders, N. H., Stanhope, Jersey (1).** | | | | | | | | | | |
| The Wattle's Princess 6th | Vol. 32 | 273 | 20 | 6,894 | 4·77 | 328·5 | 230 | Jr. 2 | .. .. | Sweet Haven Oxford Count |
| **Fairchild and Clutterbuck, Tinamba, Jersey (2).** | | | | | | | | | | |
| Carellen Wyandotte .. | 65881 | 273 | N.C.K. | 7,887 | 5·07 | 400·0 | 350 | Mature | 353, 412 .. | Darnum Park Lord Starbright |
| Fairbank Butterfly 2nd .. | 57253 | 273 | N.C.K. | 6,156 | 5·61 | 345·3 | 350 | Mature | 270, 330, 400, 448, 370 | Wompini Beau Brummel |
| **Fixter, A., Boisdale, Guernsey (1).** | | | | | | | | | | |
| Avonview Dot 2nd .. | 9867 | 273 | N.C.K. | 6,643 | 5·25 | 349·0 | 250 | Sr. 2 | 302 .. | Avonview Monogram 12th |
| **Gay, R. G., and Son, Yarram, Jersey (4).** | | | | | | | | | | |
| Elm Grove Buttercup 3rd .. | 61461 | 273 | N.C.K. | 8,355 | 5·19 | 433·4 | 350 | Mature | 264, 499, 459, 365 | Elm Grove Graceful Masterpiece |
| Elm Grove Golden Dawn .. | 71180 | 273 | N.C.K. | 7,674 | 4·87 | 374·1 | 350 | Mature | 369, 414, 436 | Glen Iris Golden Man |
| Elm Grove Golden Sunshine | Vol. 31 | 273 | N.C.K. | 6,382 | 5·66 | 361·0 | 230 | Jr. 2 | .. .. | Glen Iris Golden Man |
| Elm Grove Linda 8th .. | 76115 | 273 | N.C.K. | 7,953 | 5·20 | 413·7 | 350 | Mature | 306, 366, 400 | Glen Iris Golden Man |
| **Handbury, J. E., and Son, Toora, Jersey (2).** | | | | | | | | | | |
| Tooravale Lassie 44th .. | 89325 | 273 | N.C.K. | 7,131 | 5·84 | 416·2 | 330 | Sr. 4 | 368, 425 .. | Tooravale Noble |
| Tooravale Princess 46th .. | 89336 | 273 | N.C.K. | 7,893 | 5·71 | 450·8 | 270 | Jr. 3 | 287 .. | Pinewood's Aristocrat (Imp.) |
| **Hardie, R., Lardner, Jersey (3).** | | | | | | | | | | |
| Ewelme Northern Briar .. | 33152 | 273 | 22½ | 9,398 | 5·04 | 473·3 | 350 | Mature | .. .. | Glen Iris Northern Master |
| Glen Urquhart Sunbeam .. | Vol. 32 | 273 | 18 | 5,934 | 5·57 | 330·8 | 250 | Sr. 2 | .. .. | Maxmount Pearl's Laddie |
| Maxmount Golden Butter-maid | 87699 | 273 | 13½ | 6,836 | 5·47 | 374·1 | 330 | Sr. 4 | 339, 376, 377 | Maxmount Danny Boy |
| **Harvey, T., Boisdale, Jersey (10).** | | | | | | | | | | |
| Jerseyholm Bluebell 32nd.. | 62304 | 273 | N.C.K. | 9,390 | 5·39 | 506·5 | 350 | Mature | 377, 285, 387, 493 | Jerseyholm Master's Fox 35th |
| Jerseyholm Bluebell 69th.. | 81959 | 273 | N.C.K. | 7,646 | 4·89 | 374·2 | 250 | Sr. 2 | 301 .. | Mornmoot Memnon 2nd |
| Jerseyholm Empress 78th.. | 81960 | 273 | N.C.K. | 7,026 | 5·67 | 398·7 | 270 | Jr. 3 | 311 .. | Orphanage Molly's Commander |
| Jerseyholm Empress 86th.. | 81966 | 273 | N.C.K. | 6,527 | 5·28 | 344·7 | 250 | Sr. 2 | .. .. | Mornmoot Memnon 2nd |
| Jerseyholm Kirsty 43rd .. | 81967 | 273 | N.C.K. | 6,103 | 4·97 | 303·8 | 290 | Sr. 3 | 290 .. | Orphanage Molly's Commander |
| Jerseyholm Kirsty 44th .. | 86983 | 273 | N.C.K. | 7,635 | 4·62 | 353·1 | 250 | Sr. 2 | .. .. | Mornmoot Memnon 2nd |
| Jerseyholm Lady Marge 17th | 67197 | 273 | N.C.K. | 6,409 | 5·75 | 368 5 | 350 | Mature | 278, 131, 250, 394 | Rowallan Silvanite |
| Jerseyholm Lady Marge 19th | 71979 | 273 | N.C.K. | 8,616 | 4·68 | 403·3 | 350 | Mature | 288, 319, 398 | Orphanage Molly's Commander |
| Jerseyholm Lady Marge 29th | 86986 | 273 | N.C.K. | 7,058 | 5·31 | 374·8 | 230 | Jr. 2 | .. .. | Orphanage Zaffarine's Chief |
| Jerseyholm Lady Marge 30th | 86987 | 273 | N.C.K. | 6,120 | 5·41 | 331·1 | 230 | Jr. 2 | .. .. | Orphanage Zaffarine's Chief |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Haywood, Dr. A. R., Hastings, Jersey (8).** | | | | | | | | | | |
| Windrest Chevy's Beauty.. | 74576 | 273 | N.C.K. | 8,912 | 6·06 | 540·0 | 350 | Mature | 377, 515, 530, 438 | Gadget (Imp.) |
| Windrest Chevy's Betty .. | Vol. 31 | 273 | N.C.K. | 6,497 | 6·57 | 426·7 | 350 | Mature | 482, 356, 361 | Gadget (Imp.) |
| Windrest Chevy's Maiden.. | 79658 | 273 | N.C.K. | 9,339 | 6·14 | 573 7 | 350 | Mature | 468, 627, 459 | Gadget (Imp.) |
| Windrest Chevy's Matilda.. | 84589 | 273 | N.C.K. | 8,844 | 6·15 | 544·2 | 330 | Sr. 4 | 458, 440 .. | Gadget (Imp.) |
| Windrest Gadget's Love .. | Vol. 31 | 273 | N.C.K. | 7,416 | 4·94 | 366·5 | 230 | Jr. 2 | .. .. | Gadget (Imp.) |
| Windrest Island Serene . | 79660 | 273 | 26½ | 9,215 | 5·65 | 521·0 | 350 | Mature | 462, 493, 281 | Gadget (Imp.) |
| Windrest Island Starbright | 79661 | 273 | N.C.K. | 10,101 | 4·81 | 486·2 | 350 | Mature | 410, 453 .. | Windrest Dreaming Pioneer |
| Windrest Twinkle's Beautiful | 74583 | 273 | N.C.K. | 8,519 | 6·50 | 553·5 | 350 | Mature | 413, 491, 593, 563 | Gadget (Imp.) |
| **Hicks, E. J., Blains, Jersey (2).** | | | | | | | | | | |
| Echuca Betty .. .. | 76023 | 273 | N.C.K. | 3,440 | 5·27 | 181·2 | 350 | Mature | 244, 292 .. | Ullina Bellboy |
| Echuca Duchess .. | 81110 | 273 | N.C.K. | 5,970 | 5·04 | 300·8 | 330 | Sr. 4 | 309, 377 .. | Ullina Bellboy |
| **Higgins, J. A. A., Keysborough, Guernsey (3).** | | | | | | | | | | |
| Brighton Vale De Lys .. | 8368 | 273 | 11 | 4,518 | 4·07 | 183·7 | 350 | Mature | 186, 344, 226 | Melbourne Golden Power |
| Brighton Vale Sunshine .. | 8373 | 273 | 7 | 5,091 | 4·63 | 235·8 | 330 | Sr. 4 | 331, 242 .. | Melbourne Alain D'Or |
| Kentdale Mavis .. .. | 7229 | 273 | 6 | 4,998 | 4·61 | 230·3 | 350 | Mature | 241, 327, 221 | Kentdale Anthony |
| **Hore, E., Leitchville, Jersey (10).** | | | | | | | | | | |
| Milvue Aim's Bettwys .. | 87850 | 273 | N.C.K. | 7,753 | 4·84 | 375·5 | 250 | Sr. 2 | 305 .. | Belgonia Peggy 11th's Aim |
| Milvue Aim's Dainty .. | 82841 | 273 | N.C.K. | 7,765 | 5·72 | 444·3 | 290 | Sr. 3 | 345, 391 .. | Belgonia Peggy 11th's Aim |
| Milvue Aim's Mabel 2nd .. | Vol. 31 | 273 | N.C.K. | 6,747 | 4·99 | 336·9 | 230 | Jr. 2 | .. .. | Belgonia Peggy 11th's Aim |
| Milvue Design's Bettwys.. | 72839 | 273 | N.C.K. | 10,905 | 4·72 | 514·4 | 350 | Mature | 353, 459, 487, 483 | Milvue Rosalind's Ruler |
| Milvue Design's Dainty 4th | Vol. 31 | 273 | N.C.K. | 6,594 | 4·64 | 305·7 | 230 | Jr. 2 | .. .. | Belgonia Suspense's Design |
| Milvue Larkspur 5th .. | 87864 | 273 | N.C.K. | 6,593 | 5 71 | 376·2 | 250 | Sr. 2 | 313 .. | Belgonia Peggy 11th's Aim |
| Milvue Rosecleaf 4th .. | 87868 | 273 | N.C.K. | 8,748 | 4·72 | 412·8 | 270 | Jr. 3 | 286 .. | Belgonia Suspense's Design |
| Milvue Rosebud 5th .. | 87867 | 273 | N.C.K. | 5,156 | 5·34 | 275·2 | 230 | Jr. 2 | .. .. | Belgonia Suspense's Design |
| Milvue Rosebud 3rd .. | 82857 | 273 | N.C.K. | 5,739 | 6·03 | 346·2 | 330 | Sr. 4 | 339, 397, 416 | Belgonia Suspense's Design |
| The Wattles Molleen 12th | Vol. 31 | 273 | N.C.K. | 6,882 | 4·73 | 325·2 | 230 | Jr. 2 | .. .. | Sweet Haven Oxford Count |
| **Hore, M. T., Horfield, Friesian (6).** | | | | | | | | | | |
| Elmar Fashion .. .. | Vol. 15 | 273 | N.C.K. | 11,649 | 3·32 | 386·6 | 330 | Sr. 4 | 251, 362 .. | Burnbank Iona Rock |
| Elmar Galaholme .. | C.R. | 273 | N.C.K. | 9,032 | 3·27 | 297·3 | 270 | Jr. 3 | 259 .. | Elmar Majoe Galatea |
| Elmar Majoe .. .. | Vol. 15 | 273 | N.C.K. | 14,482 | 3·03 | 438·5 | 350 | Mature | 382, 414, 553, 406, 379 | Greenvale Oakwood Posch |
| Elmar Monica 4th .. | C.R. | 273 | N.C.K. | 6,473 | 3·20 | 207·2 | 230 | Jr. 2 | .. .. | Burnbank Iona Rock |
| Elmar Multi Majoe .. | Vol. 15 | 273 | N.C.K. | 8,700 | 2·76 | 240·3 | 230 | Jr. 2 | .. .. | Burnbank Iona Rock |
| Kurrajong Multi Majoe 5th | Vol. 15 | 273 | N.C.K. | 11,593 | 2·77 | 320·6 | 330 | Sr. 4 | 235, 338 .. | Elmar Majoe Galatea |
| **Huffer, J. A., Gormandale, Jersey (4).** | | | | | | | | | | |
| Glenvalley Coral Sand 8th | 81531 | 273 | N.C.K. | 5,408 | 5·88 | 317·9 | 290 | Sr. 3 | 232 .. | Avon Bonaparte |
| Glenvalley Mercedes Fancy 2nd | C.R. | 273 | N.C.K. | 5,393 | 6·10 | 323·8 | 250 | Sr. 2 | .. .. | Glenvalley President |
| Glenvalley Silver Wattle .. | 81534 | 273 | N.C.K. | 8,744 | 5·53 | 483·7 | 330 | Sr. 4 | 358 .. | Glenvalley Waverley's Expectation |
| Glenvalley Waverley Lass 10th | 76540 | 273 | N.C.K. | 8,537 | 5·94 | 506·8 | 330 | Sr. 4 | 325, 394 .. | Glenvalley Waverley's Expectation |
| **Hurry, Estate of the late W. H., Koonwarra, Jersey (4).** | | | | | | | | | | |
| Kooreena Lucy .. .. | 87289 | 273 | 10½ | 4,982 | 6·27 | 312·5 | 290 | Sr. 3 | 250 .. | Kooreena Audrey 7th's Best |
| Kooreena Maranta 22nd .. | Vol. 31 | 273 | 12½ | 4,163 | 6·29 | 261·9 | 250 | Sr. 2 | .. .. | Kooreena Rover 3rd |
| Kooreena Maranta 23rd .. | Vol. 31 | 273 | 17 | 5,315 | 5·29 | 281·2 | 230 | Jr. 2 | .. .. | Kooreena Rover 3rd |
| Kooreena Yo Yo 10th .. | Vol. 31 | 273 | 15 | 5,625 | 5·90 | 332·0 | 290 | Sr. 3 | .. .. | Kooreena Carrie 4th's Laddie |
| **Jackson, H., Lockington, Jersey (5).** | | | | | | | | | | |
| Lockington Duchess .. | Vol. 31 | 273 | N.C.K. | 6,465 | 6·22 | 401·9 | 230 | Jr. 2 | .. .. | Finchley Viceroy |
| Lockington Duke's Buttercup | Vol. 31 | 273 | N.C.K. | 7,320 | 4·95 | 362·1 | 230 | Jr. 2 | .. .. | Bellaire Grenadier |
| Milvue Aim's Coronation .. | C.R. | 273 | N.C.K. | 10,128 | 6·36 | 644·6 | 290 | Sr. 3 | 528 .. | Belgonia Peggy 11th's Aim |
| Milvue Aim's Honesty 10th | Vol. 31 | 273 | N.C.K. | 7,511 | 5·65 | 424·1 | 250 | Sr. 2 | 374 .. | Belgonia Peggy 11th's Aim |
| Surrey Buttercup 17th .. | C.R. | 273 | N.C.K. | 7,956 | 6·33 | 503·8 | 250 | Sr. 2 | 448 .. | Orphanage Attraction's Knight |
| **Johnson, F. G., Horsham, Jersey (6).** | | | | | | | | | | |
| Devon Park Standard Daisy | 85971 | 273 | N.C.K. | 4,692 | 6·13 | 287·6 | 270 | Jr. 3 | 201 .. | Brampton Sporting Standard (Imp.) |
| Orphanage Audrey's Molly 9th | 78244 | 273 | N.C.K. | 4,769 | 6·23 | 296·9 | 350 | Mature | 297 .. | Retford King Bracken |
| Orphanage Clara 7th .. | 73300 | 273 | N.C.K. | 5,912 | 5·68 | 335·7 | 350 | Mature | 343, 319 .. | Banyule Silverstone |
| Springhurst Rochette Tulip | 89005 | 273 | N.C.K. | 4,434 | 5·37 | 238·1 | 230 | Jr. 2 | .. .. | Bellefaire Superlative Pride |
| Springhurst Sultana Narcissus | 89006 | 210 | N.C.K. | 3,037 | 5·04 | 153·0 | 230 | Jr. 2 | .. .. | Springhurst Oxford's Sultan |
| Springhurst Superlative Narcissus | 89010 | 150 | N.C.K. | 2,175 | 4·65 | 101·1 | 230 | Jr. 2 | .. .. | Bellefaire Superlative Pride |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk last day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Keele, H. A., Bamawm, Jersey (1).** | | | | | | | | | | |
| Waroin Locust 3rd .. | 89532 | 273 | N.C.K. | 5,862 | 5·36 | 314·3 | 230 | Jr. 2 | .. .. | Pine Ridge Volunteer |
| **Lancaster, E. H., Lilydale, Jersey (3).** | | | | | | | | | | |
| Beverley Bank Princess Marilyn | 80311 | 273 | 12 | 5,401 | 5·97 | 322·2 | 310 | Jr. 4 | 332, 337 .. | Clifford Farm Lucky Bo |
| Clifford Farm Lady Isobel | Vol. 31 | 273 | 9½ | 4,961 | 5·83 | 289·4 | 250 | Sr. 2 | .. .. | Clifford Farm Lucky Bo |
| Clifford Farm Lady Marie | Vol. 31 | 273 | 10 | 5,675 | 5·70 | 323·4 | 230 | Jr. 2 | .. .. | Clifford Farm Danny Bo |
| **Langlands, F. B., Horsham, Jersey (2).** | | | | | | | | | | |
| Brierwood Clementine's Petal | 75349 | 273 | N.C.K. | 4,701 | 5·07 | 238·4 | 350 | Mature | 336, 329, 329 | Murona Twylair |
| Brierwood Vanity 4th .. | Vol. 31 | 273 | N.C.K. | 5,822 | 4·83 | 281·1 | 250 | Sr. 2 | .. .. | Werribee Leader |
| **Lind, A. E. and Sons, Mount Taylor, Jersey (1).** | | | | | | | | | | |
| Sunny Dell Statuette 2nd.. | Vol. 31 | 273 | 14 | 5,159 | 5·88 | 303·1 | 230 | Jr. 2 | .. .. | Mornmoot War Chief |
| **Longerenong Agricultural College, Dooen, Ayrshire (1).** | | | | | | | | | | |
| Longerenong Palm 5th .. | 35678 | 273 | N.C.K. | 7,411 | 4·68 | 346·9 | 270 | Jr. 3 | .. .. | Dookie Signet |
| **Macauley, C. W. W., Rochester, Jersey (6).** | | | | | | | | | | |
| Taranah Flora 6th .. | 89148 | 273 | N.C.K. | 5,475 | 5·30 | 290·1 | 290 | Sr. 3 | 371, 333 .. | Werribee Twylish Master |
| Taranah Flora 12th .. | Vol. 31 | 273 | N.C.K. | 5,136 | 5·06 | 259·7 | 230 | Jr. 2 | .. .. | Cormal Oxford Lad |
| Taranah Flora 14th .. | C.R. | 273 | N.C.K. | 4,767 | 6·04 | 287·9 | 230 | Jr. 2 | .. .. | Five Gums King's Lark |
| Taranah Floss 9th .. | C.R. | 273 | N.C.K. | 5,504 | 4·62 | 254·2 | 230 | Jr. 2 | .. .. | Cormal Oxford Lad |
| Taranah Floss 10th .. | C.R. | 273 | 10 | 3,780 | 5·28 | 199·5 | 230 | Jr. 2 | .. .. | Cormal Oxford Lad |
| Taranah Rainbow 7th .. | 89150 | 210 (sold) | .. | 3,720 | 5·56 | 206·7 | 290 | Sr. 3 | 256, 298 .. | Taranah Dignity |
| **McCormack, M. and Sons, Mansfield, Red Poll (9).** | | | | | | | | | | |
| Cypress Cherry Plum .. | 6387AA | 273 | N.C.K. | 7,527 | 3·76 | 282·9 | 350 | Mature | 298, 309, 318 | Northwood Prior |
| Cypress Countess.. .. | 7232AA | 273 | N.C.K. | 7,232 | 3·53 | 255·4 | 330 | Sr. 4 | 277 .. | Burnwood Whistler |
| Cypress Emma 2nd .. | 2478C | 273 | N.C.K. | 5,903 | 4·31 | 254·3 | 350 | Mature | 390, 424 .. | Woodburn Earl |
| Cypress Enid .. .. | 5118C | 273 | N.C.K. | 6,785 | 3·70 | 250·8 | 350 | Mature | 413, 372, 341 | Woodburn Glennie |
| Cypress Honeytime .. | 6391AA | 273 | N.C.K. | 7,217 | 3·66 | 264·5 | 350 | Mature | 298, 295 .. | Northwood Prior |
| Cypress Jemimah 2nd .. | 8236AA | 273 | N.C.K. | 5,157 | 4·05 | 209·0 | 250 | Sr. 2 | .. .. | Tatong Honeymoon |
| Cypress Judith .. .. | 3110B | 273 | N.C.K. | 9,489 | 3·35 | 317·7 | 350 | Mature | 356, 424, 279 | Woodburn Glennie |
| Cypress Laura 2nd .. | Vol. 12 | 273 | N.C.K. | 5,683 | 4·16 | 236·3 | 250 | Sr. 2 | 160 .. | Burnwood Whistler |
| Cypress Wild Plum .. | 7700A | 273 | N.C.K. | 8,262 | 3·64 | 301·1 | 310 | Jr. 4 | 229 .. | Burnwood Whistler |
| **McKenzie, Mrs. E. J., and Sons, Woodford, Jersey (3).** | | | | | | | | | | |
| Jubilee Lentil .. .. | 87030 | 273 | 16½ | 5,873 | 5·33 | 312·8 | 290 | Sr. 3 | 220 .. | Werribee Stylish Masterpiece |
| Spring Valley Eremurus .. | 83924 | 273 | 18 | 6,507 | 4·43 | 288·0 | 330 | Sr. 4 | 248, 265, 320 | Pine Grove Larkspur's King |
| Spring Valley Rose Dream 3rd | 88984 | 273 | 14 | 6,426 | 4·84 | 310·9 | 270 | Jr. 3 | 300 .. | Selsey Gay Prince |
| **McNabb, G., and Son, Irrewillipe East, Jersey (12).** | | | | | | | | | | |
| Maxon Count's Alsyke 9th | Vol. 31 | 273 | N.C.K. | 4,718 | 6·89 | 325·3 | 230 | Jr. 2 | .. .. | Maxon Handsome Count |
| Maxon Count's Pet .. | Vol. 31 | 273 | N.C.K. | 4,923 | 6·01 | 296·0 | 230 | Jr. 2 | .. .. | Maxon Handsome Count |
| Maxon Count's Plunder .. | 87718 | 273 | N.C.K. | 3,745 | 6·57 | 246·0 | 230 | Jr. 2 | .. .. | Maxon Handsome Count |
| Maxon D's Alsyke 2nd .. | 82699 | 273 | N.C.K. | 4,874 | 6·08 | 296·4 | 290 | Sr. 3 | 223 .. | Maxon Count's Dawn |
| Maxon D's Cornice .. | 82702 | 273 | N.C.K. | 6,132 | 5·56 | 341·2 | 310 | Jr. 4 | 269, 328 .. | Maxon Count's Dawn |
| Maxon Handsome Favourite 2nd | 77629 | 273 | N.C.K. | 6,692 | 6·03 | 403·6 | 330 | Sr. 4 | 351, 327 .. | Maxon Handsome Boy |
| Maxon Handsome Goldfinch | 82716 | 273 | N.C.K. | 5,900 | 6·18 | 364·5 | 290 | Sr. 3 | 371, 320 .. | Maxon Handsome Boy |
| Maxon Madeira's Daisy 2nd | 87727 | 273 | N.C.K. | 4,844 | 5·32 | 257·8 | 250 | Sr. 2 | .. .. | Avalon Prince Madeira 26th |
| Maxon Madeira's Estella .. | Vol. 31 | 273 | N.C.K. | 5,406 | 5·56 | 300·4 | 230 | Jr. 2 | .. .. | Avalon Prince Madeira 26th |
| Maxon Madeira's Favourite 5th | Vol. 31 | 273 | N.C.K. | 5,415 | 4·78 | 258·7 | 230 | Jr. 2 | .. .. | Avalon Prince Madeira 26th |
| Maxon Madeira's Light 3rd | Vol. 31 | 273 | N.C.K. | 5,819 | 5·35 | 311·6 | 230 | Jr. 2 | .. .. | Avalon Prince Madeira 26th |
| Maxon S.B's Alsyke .. | 82724 | 273 | N.C.K. | 6,351 | 5·40 | 342·7 | 290 | Sr. 3 | 249, 308 .. | Maxon Pansy's Starbright |
| **Maher, R. H., Tongala, Jersey (5).** | | | | | | | | | | |
| Rosemont Jenny Lind 22nd | 88808 | 273 | N.C.K. | 7,347 | 5·01 | 370·5 | 290 | Sr. 3 | 217 .. | Belgonia Aim High |
| Rosemont Jenny Lind 25th | Vol. 31 | 273 | N.C.K. | 7,170 | 5·38 | 385·9 | 270 | Jr. 3 | .. .. | Belgonia Perree |
| Rosemont Lady Fowler 27th | 83723 | 273 | N.C.K. | 7,268 | 5·28 | 383·5 | 350 | Mature | 232, 328 .. | Belgonia Perree |
| Rosemont Lady Fowler 39th | 88813 | 273 | N.C.K. | 7,111 | 5·44 | 387·0 | 290 | Sr. 3 | 223 .. | Belgonia Aim High |
| Rosemont Silvermine 16th | 83737 | 273 | N.C.K. | 6,966 | 5·16 | 359·6 | 330 | Sr. 4 | 238 .. | Belgonia Perree |
| **Manly, R. A. A., Somerville, Dairy Shorthorn (1).** | | | | | | | | | | |
| Lightwood Queenie .. | 2546E | 273 | 19 | 7,647 | 3·34 | 255·1 | 250 | Sr. 2 | .. .. | Willow Park Duke 18th |
| **Meaklim Bros., Mooroopna, Dairy Shorthorn (2).** | | | | | | | | | | |
| Drumneil Beauty 8th .. | C.C. | 273 | 19½ | 7,979 | 3·80 | 303·4 | 230 | Jr. 2 | .. .. | Drumneil Comet |
| Drumneil Dulcie 4th .. | C.C. | 273 | N.C.K. | 7,800 | 3·61 | 281·2 | 250 | Sr. 2 | .. .. | Drumneil Comet |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire |
|---|---|---|---|---|---|---|---|---|---|---|
| **Mitchell, R. H., Linton, Jersey (5).** | | | | | | | | | | |
| Clifford Farm Estelle .. | Vol. 31 | 273 | 22½ | 6,415 | 5·62 | 360·3 | 250 | Sr. 2 | 371 .. | Clifford Farm Sergeant Major |
| Clifford Farm Mavis .. | 80743 | 273 | 24½ | 8,294 | 5·17 | 428·5 | 310 | Jr. 4 | 358, 410 .. | Clifford Farm Lucky Boy |
| Clifford Farm Rita .. | 75663 | 273 | 24½ | 7,905 | 6·42 | 507·6 | 330 | Sr. 4 | 482, 459 .. | Clifford Farm Skipper |
| Clifford Farm Sandra .. | 85614 | 273 | 29½ | 10,634 | 5·06 | 537·8 | 270 | Jr. 3 | 448 .. | Clifford Farm Leo |
| Clifford Farm Shirley .. | 75665 | 273 | 19½ | 7,571 | 5·69 | 430·7 | 350 | Mature | 391, 411, 391 | Clifford Farm Danny Boy |
| **Moore, J., and Co., Yarram, Jersey (5).** | | | | | | | | | | |
| Tooloonook Camille 2nd .. | 79248 | 273 | N.C.K. | 4,920 | 4·92 | 242·1 | 350 | Mature | 172, 344, 303 | Belgonia Lady's Duke |
| Tooloonook Camille 8th .. | C.R. | 273 | N.C.K. | 4,712 | 4·41 | 207·7 | 230 | Jr. 2 | .. .. | Mornmoot Mormon 3rd |
| Tooloonook Onyx .. | 69399 | 273 | N.C.K. | 4,332 | 4·84 | 209·5 | 350 | Mature | 302, 248, 272, 356, 263 | Rydon Premier |
| Tooloonook Polygold 2nd | 84237 | 273 | N.C.K. | 6,981 | 4·90 | 342·0 | 350 | Mature | 461, 291 .. | Latrobe Musician |
| Tooloonook Sainfoin 7th .. | 74216 | 273 | N.C.K. | 4,580 | 5·43 | 248·7 | 350 | Mature | 184, 203, 395, 320 | Belgonia Lady's Duke |
| **Nicholas, M. A., Sherbrooke, Jersey (5).** | | | | | | | | | | |
| Selsey Golden Rose .. | 69062 | 273 | 14 | 6,987 | 5·06 | 353·4 | 350 | Mature | 322, 361, 332, 386 | Samares Golden Prince (Imp.) |
| Selsey Rowan 4th .. | 78881 | 273 | 24½ | 8,969 | 5·59 | 501·4 | 310 | Jr. 4 | 270, 340 .. | Brampton Son of Champions (Imp.) |
| Selsey Royal Lily .. | 73882 | 273 | 19 | 8,564 | 5·12 | 438·2 | 350 | Mature | 358, 309, 371 | Selsey Right Royal |
| Selsey Royal Wyandotte 2nd | 78884 | 273 | 18½ | 7,887 | 5·38 | 424·4 | 330 | Sr. 4 | 313, 245 .. | Selsey Right Royal |
| Selsey Samare's Wyandotte | 69071 | 273 | 26 | 9,653 | 6·05 | 583·7 | 350 | Mature | 407, 337, 448, 370 | Samare's Golden Prince (Imp.) |
| **Nicholson, A. N., Lang Lang, Illawarra Shorthorn (3).** | | | | | | | | | | |
| Devondale Buttercup 11th.. | Vol. 9 | 273 | N.C.K. | 7,494 | 4·65 | 348·1 | 310 | Jr. 4 | 297 .. | Devondale Guardsman |
| Veresdale Cherry 2nd .. | 33736 | 273 | N.C.K. | 8,187 | 3·56 | 291·3 | 330 | Sr. 4 | 284, 212 .. | Ovensdale Pearl's Renown |
| Veresdale Dahlia .. | 33739 | 210 | .. | 4,815 | 3·25 | 156·7 | 330 | Sr. 4 | 277, 281 .. | Ovensdale Pearl's Renown |
| **Noonan, G., Benalla, Jersey (7).** | | | | | | | | | | |
| Noonavale Aim's Beauty | Vol. 31 | 273 | N.C.K. | 5,115 | 5·43 | 277·7 | 250 | Sr. 2 | .. .. | Rosemont High Aim |
| Noonavale Aim's Fowler .. | Vol. 31 | 273 | N.C.K. | 5,475 | 5·46 | 298·7 | 230 | Jr. 2 | .. .. | Rosemont High Aim |
| Noonavale Aim's Silvermine | Vol. 31 | 273 | N.C.K. | 4,968 | 5·32 | 264·3 | 230 | Jr. 2 | .. .. | Rosemont High Aim |
| Noonavale Lady Fowler 2nd | Vol. 31 | 273 | N.C.K. | 5,388 | 6·02 | 324·1 | 290 | Sr. 3 | .. .. | Belgonia Perree |
| Noonavale Noble Beauty .. | 88267 | 273 | N.C.K. | 5,976 | 4·98 | 297·9 | 290 | Sr. 3 | 263 .. | Maroona Model's Noble |
| Noonavale Silvermine Two | Vol. 31 | 273 | N.C.K. | 4,815 | 5·69 | 274·1 | 290 | Sr. 3 | 298 .. | Belgonia Perree |
| Rosemont Silvermine 9th .. | 64069 | 273 | N.C.K. | 5,458 | 5·00 | 273·1 | 350 | Mature | 311 .. | Rosemont Laddie Fowler 3rd |
| **Parker, L. M., Tallarook, Dairy Shorthorn (4).** | | | | | | | | | | |
| Deep Dale Beauty 3rd .. | 2425E | 273 | N.C.K. | 8,591 | 3·46 | 296·9 | 310 | Jr. 4 | 290, 351 .. | Willow Park Barrington 26th |
| Deep Dale Polly 3rd .. | 2440E | 273 | N.C.K. | 11,411 | 4·01 | 457·1 | 330 | Sr. 4 | 279, 415 .. | Willow Park Barrington 26th |
| Deep Dale Rachel 2nd .. | 2441E | 273 | N.C.K. | 10,008 | 3·80 | 380·1 | 310 | Jr. 4 | 274, 301 .. | Willow Park Barrington 26th |
| Deep Dale Rose .. .. | 1818E | 273 | N.C.K. | 9,366 | 3·37 | 316·1 | 350 | Mature | 328, 362, 325 | Willow Park Barrington 26th |
| **Parkes, E. F., Trafalgar, Jersey (5).** | | | | | | | | | | |
| Irona D.C's. Wendy .. | 81899 | 273 | N.C.K. | 6,012 | 6·60 | 396·9 | 330 | Sr. 4 | 310, 279, 326 | Victoria Dandy Boy |
| Irona Design's Benedictine | Vol. 31 | 273 | N.C.K. | 3,738 | 5·94 | 221·9 | 230 | Jr. 2 | .. .. | Navua Sociable Designer |
| Irona Design's Biddy .. | Vol. 31 | 240 | .. | 3,202 | 5·96 | 190·7 | 250 | Sr. 2 | .. .. | Navua Sociable Designer |
| Irona Design's Cobra .. | Vol. 32 | 273 | N.C.K. | 3,554 | 5·45 | 193·8 | 230 | Jr. 2 | .. .. | Navua Sociable Designer |
| Irona Estella Benedictine | Vol. 32 | 273 | 12 | 4,161 | 5·04 | 209·6 | 230 | Jr. 2 | .. .. | Navua Sociable Designer |
| **Payne, A. E. T., Lilydale, Guernsey (7).** | | | | | | | | | | |
| Yarraview Beryl .. | 8197 | 273 | 13 | 7,607 | 5·58 | 424·6 | 350 | Mature | 485, 560, 526, 530, 596 | Honoria's Benefactor (Imp.) |
| Yarraview Essie .. | 5169 | 273 | 32½ | 11,888 | 5·16 | 613·8 | 350 | Mature | 292, 316, 583, 510, 513, 517, 586, 498 | Camilla's Majestic of Maple Lodge (Imp.) |
| Yarraview Faithful .. | 11963 | 273 | 18 | 6,852 | 4·65 | 318·9 | 230 | Jr. 2 | .. .. | Yarraview Sovereign |
| Yarraview Honoria .. | 9776 | 273 | 23½ | 10,001 | 4·12 | 412·4 | 350 | Mature | 337, 444, 407, 483 | Honoria's Benefactor (Imp.) |
| Yarraview Remembrance | 11972 | 273 | 17½ | 7,121 | 4·61 | 328·0 | 290 | Sr. 3 | 334 .. | Camilla's Majestic of Maple Lodge (Imp.) |
| Yarraview Roulette .. | 9789 | 273 | 39½ | 12,915 | 5·19 | 670·6 | 330 | Sr. 4 | 465, 453, 422 | Sunrose of Maple Lodge (Imp.) |
| Yarraview Rougette .. | 9788 | 273 | 33 | 13,163 | 4·98 | 656·0 | 350 | Mature | 300, 731, 778 | Honoria's Benefactor (Imp.) |
| **Phillips, J. H., Swan Hill, Jersey (1).** | | | | | | | | | | |
| Ryland's Lavene .. | 83823 | 273 | 27½ | 8,601 | 4·76 | 409·2 | 330 | Sr. 4 | 251, 344, 482 | Banaview Master |
| **Powell, T. S., Mansfield, Jersey (3).** | | | | | | | | | | |
| Carellen Golden Cream 4th | 85571 | 273 | 9½ | 3,899 | 4·89 | 190·5 | 250 | Sr. 2 | 221 .. | Werribee Planet |
| Carellen Merry Maid 2nd .. | 85574 | 273 | 9 | 4,904 | 5·23 | 256 4 | 250 | Sr. 2 | .. .. | Mornmoot Viceroy 2nd |
| Carellen Starbright 4th .. | 85577 | 273 | 10 | 4,535 | 4·84 | 219 3 | 250 | Sr. 2 | .. .. | Werribee Planet |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Read, Estate of the late J. D., Springhurst, Jersey (21).** | | | | | | | | | | |
| Springhurst Ashley Nightshade | 78934 | 273 | 11 | 5,034 | 5·97 | 300·3 | 290 | Sr. 3 | .. .. | Twin Oaks Ashley Fern's Noble (Imp.) |
| Springhurst Boutillere .. | 64270 | 273 | 15 | 6,690 | 4·86 | 325·4 | 350 | Mature | 336, 424, 458, 490, 394 | Glen Iris Anemone's Standard |
| Springhurst Brampton Tulip | 64274 | 273 | 9 | 7,080 | 4·83 | 341·7 | 350 | Mature | 281, 263, 363, 433, 222 | Glen Iris Anemone's Standard |
| Springhurst Golden Tulip | 83938 | 273 | 10 | 6,707 | 4·89 | 327·9 | 270 | Jr. 3 | 269 .. | Springhurst Noble Oak |
| Springhurst Golden Yarran | 83939 | 273 | 15 | 6,378 | 4·56 | 290·6 | 250 | Sr. 2 | 212 .. | Springhurst Noble Oak |
| Springhurst Napoleonette Alsyke | 83940 | 273 | 14 | 5,006 | 6·11 | 306·1 | 250 | Sr. 2 | 293 .. | Bellefaire Superlative Pride |
| Springhurst Napoleonette Narcissus | 89001 | 273 | 18½ | 6,303 | 5·14 | 324·2 | 230 | Jr. 2 | .. .. | Bellefaire Superlative Pride |
| Springhurst Napoleonette Tulip | 89002 | 273 | 15½ | 5,234 | 5·71 | 299·0 | 230 | Jr. 2 | .. .. | Bellefaire Superlative Pride |
| Springhurst Phillidora's Narcissus | 73929 | 273 | 13 | 6,594 | 5·21 | 343·7 | 330 | Sr. 4 | 343, 434, 345 | Twin Oaks Ashley Fern's Noble (Imp.) |
| Springhurst Pride's Tulip | 83944 | 273 | 11½ | 4,115 | 5·22 | 214·9 | 250 | Sr. 2 | 183 .. | Bellefaire Superlative Pride |
| Springhurst Ronald's Alsyke | 59498 | 273 | 18 | 8,400 | 5·85 | 491·3 | 350 | Mature | 365, 545, 435, 579, 567, 439 | Bellefaire Seaborn Successor |
| Springhurst Ronald's Duchess | 64283 | 273 | 13 | 7,151 | 4·68 | 334·8 | 350 | Mature | 495, 549, 555, 522, 408 | Springhurst Sybil's Successor |
| Springhurst Soeurette Duchess | 89007 | 273 | 15½ | 5,600 | 5·56 | 311·3 | 230 | Jr. 2 | .. .. | Bellefaire Superlative Pride |
| Springhurst Soeurette Nightshade | 83945 | 273 | 16 | 5,853 | 5·40 | 316·1 | 250 | Sr. 2 | 294 .. | Bellefaire Superlative Pride |
| Springhurst Soeurette Tecoma | 78942 | 273 | 19½ | 6,947 | 5·65 | 392·7 | 310 | Jr. 4 | 332, 295 .. | Bellefaire Superlative Pride |
| Springhurst Soeurette Tulip | 73931 | 273 | 17 | 7,873 | 5·22 | 410·7 | 350 | Mature | 402, 502, 342 | Bellefaire Superlative Pride |
| Springhurst Superlative | 83947 | 273 | 15 | 4,642 | 5·63 | 261·3 | 270 | Jr. 3 | 260 . | Bellefaire Superlative Pride |
| Springhurst Sybil Tulip .. | 55281 | 273 | 15 | 7,218 | 5·71 | 412·5 | 350 | Mature | 329, 425, 492, 513, 450, 469, 387, 283 | Springhurst Golden Gamboge |
| Springhurst Volunteer's Nardoo | 73934 | 273 | 22½ | 7,595 | 6·19 | 470·1 | 30 | Sr. 4 | 352, 448, 393 | Springhurst Tomato's Volunteer |
| Springhurst Wexford | 78946 | 273 | 16 | 5,865 | 5·29 | 310·4 | 290 | Sr. 3 | 288, 306 .. | Twin Oaks Ashley Fern's Noble (Imp.) |
| Springhurst Wexford Tulip | 89011 | 273 | 13½ | 5,318 | 5·06 | 269·3 | 230 | Jr. 2 | .. .. | Twin Oaks Ashley Fern's Noble (Imp.) |
| **Reid, Miss B. B., Bundoora, Jersey (3).** | | | | | | | | | | |
| Jubilee Auricula .. .. | 81993 | 273 | 19 | 6,827 | 4·50 | 307·3 | 310 | Jr. 4 | 249 .. | Werribee Stylish Masterpiece |
| Jubilee Datura .. .. | 62340 | 273 | 8 | 3,627 | 5·24 | 190·1 | 350 | Mature | 297, 321 .. | Werribee Stylish Masterpiece |
| Jubilee Lindentree .. | Vol. 31 | 273 | 12 | 5,944 | 4·55 | 270·4 | 250 | Sr. 2 | .. .. | Jubilee Dipplight |
| **Richardson, W. S., Bacchus Marsh, Jersey (1).** | | | | | | | | | | |
| Normandie Mayflower 11th | 68365 | 273 | N.C.K. | 5,121 | 5·66 | 289·7 | 350 | Mature | 240, 226, 362, 338 | Normandie Majestic |
| **Ross, D. M., Croydon, Dairy Shorthorn (4).** | | | | | | | | | | |
| Willow Park Dainty 20th | 22620 | 273 | 12 | 8,688 | 3·11 | 270·0 | 290 | Sr. 3 | .. .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Dainty 21st | 23350 | 273 | 13 | 7,092 | 3·95 | 280·0 | 290 | Sr. 3 | 208 .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Damsel 12th | 15220 | 273 | 6 | 6,963 | 3·69 | 256·6 | 330 | Sr. 4 | 276, 210 .. | Willow Park Imperial Cran 10th |
| Willow Park Duchess 54th | 22680 | 273 | 16½ | 7,497 | 4·39 | 329·1 | 290 | Sr. 3 | 261 .. | Anderson Imperial Cran 6th (Imp.) |
| **St. Joseph's Home, Sebastopol, Jersey (2).** | | | | | | | | | | |
| St. Joseph's Ann .. | 83849 | 273 | 12 | 5,460 | 5·54 | 302·6 | 330 | Sr. 4 | 314, 288, 149 | Selsey Design's Standard |
| St. Joseph's Ann 2nd .. | C.R. | 273 | 16 | 6,330 | 5·63 | 356·2 | 250 | Sr. 2 | .. .. | St. Joseph's High Design |
| **Shearman, A. and W., Darnum, Jersey (1).** | | | | | | | | | | |
| Darnum Park Buttercup .. | C.R. | 273 | N.C.K. | 6,759 | 6·39 | 431·8 | 350 | Mature | 429, 562, 520, 462 | Darnum Park Minnie's Boy |
| **Smith Bros., Mirboo North, Jersey (3).** | | | | | | | | | | |
| Sylvan Hill Butterfly .. | Vol. 31 | 273 | N.C.K. | 4,728 | 5·29 | 250·0 | 230 | Jr. 2 | .. .. | Werribee Viceroy |
| Sylvan Hill Glitter .. | Vol. 31 | 273 | N.C.K. | 6,015 | 4·47 | 268·9 | 230 | Jr. 2 | .. .. | Werribee Viceroy |
| Sylvan Hill Larkspur .. | 69190 | 273 | N.C.K. | 5,657 | 6·33 | 358·1 | 350 | Mature | 270, 338, 377, 360, 379, 364 | Glen Iris Bow Bella |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk last day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Smith, R. W., and Son, Koo-wee-rup, Friesian (1).** | | | | | | | | | | |
| Wattle Bank Cremona 3rd | Vol. 15 | 273 | 13 | 8,411 | 3·86 | 324·9 | 350 | Mature | 368, 382, 412, 429 | Hengest Lizzie Segis |
| **Stephens, Dr. F. G., Vermont, Guernsey (6).** | | | | | | | | | | |
| Vermont Annie .. .. | 11743 | 273 | 15 | 4,877 | 5·14 | 250·8 | 230 | Jr. 2 | .. .. | Vermont Camilla's Sunrise |
| Vermont Eve .. .. | 9559 | 273 | 16 | 5,856 | 5·93 | 347·5 | 310 | Jr. 4 | .. .. | Melbourne Golden Lodestar |
| Vermont Flossie .. | 11745 | 273 | 19 | 6,057 | 5·22 | 316·1 | 230 | Jr. 2 | .. .. | Vermont Camilla's Sunrise |
| Vermont Lola .. .. | 11747 | 273 | 40½ | 11,357 | 4·33 | 491·9 | 230 | Jr. 2 | .. .. | Melbourne Fleur's Victory |
| Vermont Mabel .. .. | 11748 | 273 | 25 | 7,620 | 5·76 | 438·8 | 250 | Sr. 2 | .. .. | Melbourne Fleur's Victory |
| Vermont Queen .. .. | Vol. 15 | 273 | 18 | 6,084 | 5·17 | 314·7 | 230 | Jr. 2 | .. .. | Melbourne Fleur's Victory |
| **Syme, D., Woori Yallock, Guernsey (1).** | | | | | | | | | | |
| Meadow Vale Bouquet .. | 10872 | 273 | N.C.K. | 6,110 | 4·29 | 261·9 | 330 | Sr. 4 | 235, 295 .. | Yarraview Marvel |
| **Tait, W. G., Dreelte, Jersey (3).** | | | | | | | | | | |
| Lara Pansy 15th .. | 82352 | 273 | 13 | 5,754 | 5·22 | 300·5 | 290 | Sr. 3 | 314, 354 .. | Avalon Prince Madeira 8th |
| Stonybank Gaiety Girl 14th | 83977 | 273 | 14½ | 5,894 | 4·77 | 281·3 | 250 | Sr. 2 | 311 .. | Mornmoot War Ward |
| Stonybank Snowdrop 10th | 89032 | 273 | 14 | 5,972 | 5·49 | 327·6 | 230 | Jr. 2 | .. .. | Mornmoot War Ward |
| **Tandberg, G., and Son, Whitelaw, Illawarra Shorthorn (4).** | | | | | | | | | | |
| Bodalla Enid .. .. | Vol. 10 | 273 | 24 | 9,619 | 4·03 | 387·2 | 350 | Mature | .. .. | Swanlea Lancelot |
| Bodalla Fiancee .. .. | Vol. 10 | 252 | 4 | 8,075 | 4·43 | 357·5 | 350 | Mature | .. .. | Berry Pride |
| Midlands Daisy 2nd .. | Vol. 10 | 273 | 22 | 8,501 | 3·73 | 317·2 | 250 | Sr. 2 | .. .. | Alfa Vale Loyal |
| Veresdale Lulu .. .. | 28363 | 240 (Sold) | .. | 7,950 | 3·97 | 315·7 | 350 | Mature | 245, 323, 324, 249 | Veresdale Diamond |
| **Thomas and Taylor, Hamilton, Ayrshire (7).** | | | | | | | | | | |
| Jennewar Beauty .. | 30709 | 273 | 14 | 8,052 | 4·07 | 327·9 | 350 | Mature | 290, 329, 359, 377, 370, 439 | Denbigh Ace |
| Jennewar Bettina .. | 34707 | 273 | 28 | 8,778 | 4·19 | 367·5 | 310 | Jr. 4 | 310, 335 .. | Denbigh Ace |
| Jennewar Bunty .. | 34708 | 210 | 4 | 3,780 | 4·56 | 172·3 | 330 | Sr. 4 | 266, 245 .. | Denbigh Ace |
| Jennewar Lily Lady .. | 34710 | 273 | 23 | 6,665 | 4·22 | 281·2 | 310 | Jr. 4 | 306, 341 .. | Denbigh Ace |
| Jennewar Nora .. .. | 33751 | 273 | 32½ | 9,558 | 4·73 | 452·4 | 350 | Mature | 404, 530, 393 | Denbigh Ace |
| Jennewar Sweet Pea .. | 33752 | 273 | 17½ | 9,194 | 4·58 | 421·4 | 350 | Mature | 362, 396, 356 | Denbigh Ace |
| Jennewar Sylvia 3rd .. | 34711 | 273 | 28 | 8,763 | 4·20 | 368·4 | 310 | Jr. 4 | 283, 297 .. | Denbigh Ace |
| **Tomasetti, B. G., Drouin West, Ayrshire (6).** | | | | | | | | | | |
| Emoh Ruo Angie .. | Vol. 36 | 273 | N.C.K. | 8,037 | 3·67 | 294·6 | 330 | Sr. 4 | 296, 266 .. | Emoh Ruo Excellent |
| Glencorren Design .. | Vol. 36 | 273 | N.C.K. | 10,759 | 4·13 | 443·9 | 270 | Jr. 3 | 338 .. | Glencorren Peerie |
| Glencorren Edna .. | 36313 | 273 | N.C.K. | 9,272 | 4·71 | 436·8 | 350 | Mature | 303, 389, 324 | Glenfalloch Comrade |
| Glencorren Fine Quality .. | 36314 | 273 | N.C.K. | 7,093 | 3·96 | 280·8 | 270 | Jr. 3 | 322 .. | Glencorren Peerie |
| Glencorren Goldie .. | Vol. 36 | 273 | N.C.K. | 6,672 | 4·63 | 309·1 | 310 | Jr. 4 | 270, 290 .. | Glenfalloch Pilot |
| Kerlie Park Adieu .. | C.R. | 273 | N.C.K. | 7,085 | 3·72 | 263·9 | 250 | Sr. 2 | .. .. | Kerlie Park Excel |
| **Turner, A. J., Yannathan, Jersey (4).** | | | | | | | | | | |
| Fontenay Goldie .. | Vol. 31 | 273 | 10 | 4,020 | 5·49 | 220·8 | 230 | Jr. 2 | .. .. | Selsey Designer |
| Fontenay Lassie .. .. | 86294 | 273 | 10 | 5,242 | 5·08 | 266·4 | 250 | Sr. 2 | .. .. | Colyton Dandy's Aristocrat |
| Kings Vale Brunette 62nd | 87208 | 273 | 6 | 3,190 | 5·41 | 172·7 | 250 | Sr. 2 | .. .. | Kings Vale Bradman |
| Kings Vale Rosella 61st .. | 87220 | 273 | 5½ | 2,867 | 5·18 | 148·6 | 230 | Jr. 2 | .. .. | Kings Vale Bradman |
| **Tyssen, C. J., Warragul, Jersey (3).** | | | | | | | | | | |
| Hylsbroke Jolly Lassie 11th | 86854 | 273 | 12 | 6,320 | 5·17 | 326·5 | 250 | Sr. 2 | .. .. | The Wattle's Young Gamboge |
| Hylsbroke Joystep 12th .. | Vol. 31 | 210 | 4 | 3,330 | 5·49 | 182·9 | 230 | Jr. 2 | .. .. | The Wattle's Young Gamboge |
| Karoola Freda .. .. | 37699 | 257 | 4 | 5,643 | 4·77 | 269·1 | 350 | Mature | 289, 415, 415 | Glenallen Mariposa |
| **Unthank, Miss Freda, Hastings, Jersey (2).** | | | | | | | | | | |
| The Hollie's Happy .. | 84150 | 273 | 18½ | 5,613 | 5·25 | 294·5 | 290 | Sr. 3 | 250, 245 .. | The Hollie's Chief |
| The Hollie's Queen 5th .. | 84152 | 273 | 14 | 6,045 | 5·88 | 355·6 | 290 | Sr. 3 | 310, 281 .. | Windrest Rance's Lad |
| **Vaughan Bros., Girgarre, Jersey (4).** | | | | | | | | | | |
| Lynroy Heather .. | Vol. 31 | 273 | N.C.K. | 6,906 | 5·48 | 378·6 | 230 | Jr. 2 | .. .. | Lynroy Pixie's Prince |
| Lynroy Pixie's Queen .. | Vol. 31 | 273 | N.C.K. | 7,004 | 6·29 | 440·5 | 230 | Jr. 2 | .. .. | Lynroy Pixie's Prince |
| Lynroy Pretty Natty .. | Vol. 31 | 273 | N.C.K. | 5,618 | 5·55 | 311·9 | 230 | Jr. 2 | .. .. | Lynroy Pixie's Prince |
| Lynroy Venetta .. .. | Vol. 31 | 273 | N.C.K. | 7,262 | 5·51 | 400·1 | 230 | Jr. 2 | .. .. | Lynroy Pixie's Prince |
| **Wade, C. F., Stratford, Jersey (1).** | | | | | | | | | | |
| Inverbroom Bunty's Empress | 57760 | 273 | N.C.K. | 8,580 | 4·65 | 398·8 | 350 | Mature | 297, 433, 341, 406, 404, 422 | Grangelea Butter Boy 3rd |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Walker, C. S., Swan Hill, Jersey (1).** | | | | | | | | | | |
| Woolingurry Nita 6th .. | 79679 | 273 | 24 | 6,971 | 4·82 | 336 3 | 350 | Mature .. | .. | Retford Clairette's King |
| **Waterhouse, H. W. and Son, Pakenham, Jersey (4).** | | | | | | | | | | |
| Navuloa Grand Bell .. | 83098 | 273 | 14 | 7,127 | 5·14 | 366·0 | 270 | Jr. 3 | 237 .. | Navuloa Magnet's Grand-Master |
| Navuloa Grand Harebell .. | 88151 | 273 | 24½ | 7,707 | 4·93 | 380·2 | 230 | Jr. 2 | .. .. | Navuloa Magnet's Grand-master |
| Navuloa Master's Belle .. | 88155 | 273 | 18 | 6,048 | 5·23 | 316·2 | 230 | Jr. 2 | .. .. | Navuloa Magnet's Grand-master |
| Ovalau Royal Magnet .. | Vol. 31 | 273 | 17 | 6,591 | 5 29 | 301·3 | 230 | Jr. 2 | .. .. | Ovalau Magnet's King |
| **Whelpton, B., Whittlesea, Jersey (8).** | | | | | | | | | | |
| Coodardy Centurion's Jean | 75739 | 273 | 16 | 5,990 | 3·56 | 213·5 | 350 | Mature | 372, 445, 377 | Werribee Centurion |
| Hemswell Pioneer's Bloom | C.R. | 240 | 4 | 4,785 | 5·34 | 255·7 | 290 | Sr. 3 | 247 .. | Windrest Dreaming Pioneer |
| Hemswell Pioneer's Prude | 86763 | 273 | 10 | 5,857 | 5·42 | 317·2 | 290 | Sr. 3 | 305, 216 .. | Windrest Dreaming Pioneer |
| Hemswell Prude .. .. | 76769 | 240 | 4 | 7,042 | 4·45 | 313·4 | 350 | Mature | 333, 441, 300 | Clarendon Eyre Eminent's Moon 2nd |
| Hemswell Prude 2nd .. | Vol. 31 | 273 | 14 | 6,342 | 5·65 | 358·6 | 330 | Sr. 4 | 304 .. | Clarendon Eyre Eminent's Moon 2nd |
| Hemswell Richlight Cowslip | Vol. 31 | 240 | 4 | 4,972 | 4·91 | 244·1 | 310 | Jr. 4 | 210, 276 .. | Jubilee Richlight |
| Wattle Grove Jeanette 2nd | 55801 | 273 | 8½ | 4,466 | 5·34 | 238·5 | 350 | Mature | 429, 345, 292 | Fairview Chief |
| Wattle Grove Winsome .. | 74456 | 273 | 13 | 6,806 | 4·44 | 302·2 | 350 | Mature | 334, 375, 298 | Fairview Chief |
| **Williams, Estate of the late F. A., Bamawm Extension, Jersey (1).** | | | | | | | | | | |
| Bamawm Daisy Bell .. | 70172 | 273 | N.C.K. | 6,533 | 6·03 | 393·9 | 350 | Mature | 317, 405, 337 | Bamawm Bonnie Bugler |
| **Wilson, A., Port Fairy North, Ayrshire (8).** | | | | | | | | | | |
| Lough View Beauty 2nd .. | 32776 | 273 | 18 | 6,405 | 3·66 | 234·7 | 350 | Mature | 194, 264, 269 | Carracoorte Bobby |
| Lough View Blanche 3rd.. | 36578 | 273 | 12½ | 5,564 | 4·35 | 241·9 | 290 | Sr. 3 | 225 .. | Lough View Bell Lad |
| Lough View Brownie 3rd.. | 34859 | 273 | 19 | 7,169 | 4·58 | 328·6 | 330 | Sr. 4 | 199, 293 .. | Lough View Bell Lad |
| Lough View Brownie 6th.. | 36580 | 273 | 16 | 7,160 | 4·06 | 290·9 | 290 | Sr. 3 | 277 .. | Lough View Bell Lad |
| Lough View Hope .. | 35684 | 273 | 24½ | 9,267 | 3·78 | 349·9 | 330 | Sr. 4 | 259, 311 .. | Grand View Bernie |
| Lough View Music 4th .. | 36583 | 273 | 18 | 6,696 | 4·18 | 280·1 | 290 | Sr. 3 | 298 .. | Lough View Bell Lad |
| Lough View Pearline .. | 36585 | 120 | 4 | 2,737 | 3·67 | 100·4 | 290 | Sr. 3 | 236 .. | Lough View Bell Lad |
| Lough View Petunia 4th.. | 36586 | 273 | 14½ | 6,434 | 4·28 | 275·1 | 290 | Sr. 3 | 253 .. | Lough View Nubor |
| **Woodyer, P. A., Mornington, Jersey (2).** | | | | | | | | | | |
| Rochdale La Mascotte 3rd | 73708 | 273 | 17 | 6,924 | 4·76 | 329·8 | 350 | Mature | 296, 324 .. | Rochdale Lord |
| Selma Charm .. .. | 83866 | 273 | 14 | 5,226 | 5·56 | 290·7 | 330 | Sr. 4 | 234, 262 .. | Glen Iris Golden Viol |

# *Dairy Production Records*

The real worth of any cow in a dairy herd can be discovered only by recording its production, and the time taken in weighing and recording the amount of milk given by each cow is well spent because these records enable the dairyman to distinguish heavy, persistent milkers from low producers. "Non-paying guests," as they are frequently termed, are those members of the herd which fail to yield enough milk to pay for their feed and care.

Although satisfactory records can be obtained by measuring the production of each cow regularly once a month, daily individual records are the most accurate.

To the farmer who takes a personal interest in and treats each cow as an individual, recording is not a drudge but a means whereby dairy efficiency can be improved. A study of the records reveals many interesting facts which would otherwise have passed unnoticed, and it also enables unprofitable cows to be weeded out and the remainder to be fed individually. Furthermore, replacements can be chosen from heifer calves from the best cows.

[Contributed by the Live Stock Division.]

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## SUBSCRIPTION RATES

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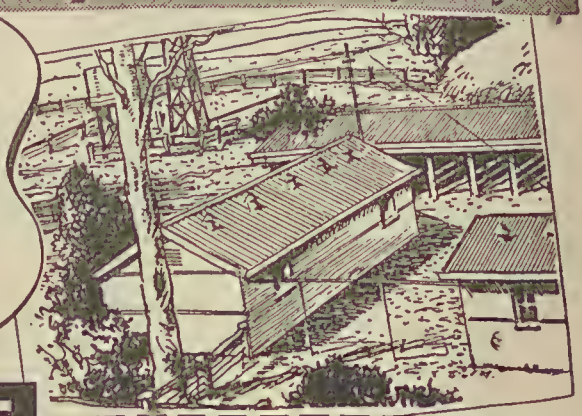

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# Fat Lamb Raising in the Mallee

## Results of Trials at the Mallee Research Station—Part 2

by H. J. Sims, M.Agr.Sc., Dip. Com., Manager, and C. G. Webb, M.Agr.Sc., Agricultural Research Officer, Mallee Research Station.

Which is the most suitable type of ewe for use as a fat lamb mother ? This is one of the most debated questions among sheep-raisers in the Mallee and, with the object of obtaining some evidence on this question and others related to the raising of fat lambs in the Mallee, a trial was begun in 1941 at the Mallee Research Station, Walpeup. In the course of this trial the ewe progeny of Merino ewes crossed with Border Leicester, Corriedale, and Dorset Horn rams were all mated to Dorset Horn rams. The results of four years' work in this field are set out in the following article.

### *Methods of Experimentation*

THE ewes for this experiment were produced by mating at the Mallee Research Station, strong wool Merino ewes with Border Leicester, Dorset Horn, and Corriedale rams. As described previously in the results of the Sire trial, published in the *Journal of Agriculture*, January, 1945, the wether lamb progeny of these matings were compared as lambs, while the ewe progeny were kept and, in due course, mated to Dorset Horn rams. Full records were kept of the weight and "appraised" value of the wool shorn from the several classes of ewes from their lamb stage onwards.

It was thought desirable also to obtain some comparisons between half-breds and Merinos, and in 1940, 40 strong wool Merino ewe lambs were purchased in South Australia and run with the half-breds. The half-bred and Merino ewes were mated as two-tooths on 14th November, 1941, there being 97 ewes in the flock. These were run as a separate flock until the conclusion of mating when the ewes were run with Merino ewes of the Sire trial. These ewes were mated again in a similar manner on 13th November, 1942, apart from the fact that 83 maiden ewes were added to the number in the trial. The ewes were again run with ewes in the Sire trial at the conclusion of mating. The 154 ewes which were mated on 16th November, 1943, were run as a separate flock right through to the sale of the lambs in September, 1944. The same details as were reported in the Sire trial above mentioned were recorded at birth and slaughter.

In addition, the birth weights of lambs were recorded in 1944. The dates of the main operations are those as reported in the Sire trial for the seasons 1941-42 and 1942-43. In 1944 shearing was conducted on 16th August, and the lambs were slaughtered on 12th September and 10th October.

### *Seasonal Conditions*

Seasonal conditions in 1941, 1942, and 1943 have been already reported. Rainfall for the duration of the experiment in 1944 is given in the following table:—

TABLE 1.—MONTHLY RAINFALL—JANUARY TO SEPTEMBER—1944.

| | |
|---|---|
| January | 20 points. |
| February | 18 points. |
| March | 39 points. |
| April | 47 points. |
| May | 156 points. |
| June | 16 points. |
| July | 97 points. |
| August | 16 points. |
| September | 48 points. |
| Total for 9 months | 457 points. |

It is seen that, apart from May, which was slightly above average, the rainfall had been so poor, both in the pre-natal and finishing periods, that it was surprising that it was possible to market any lambs at all.

Fortunately it was possible to keep the flock on stubbles until lambing was completed and the good rains in May made it possible to graze 50 acres of oats which had been sown for this purpose. Poor conditions of crop growth made it possible for the lambs to finish their growth on oats which had been sown for hay, but which gave no indication of growing to a sufficient height for cutting.

### *Results*

The returns from the ewes are in the form of wool and lambs. The results from the different crosses are discussed under the following headings:—

1. *Wool.*—(*a*) As a lamb. (*b*) As a weaner. (*c*) As a lambing ewe.
2. *Lambs.*—(*a*) Incidence of lambing and lambing percentage. (*b*) Birth weight of lambs. (*c*) Lamb weights. (*d*) Lamb grades and values.
3. *Combined wool and lamb returns.*

#### Wool.

(*a*) *As a Lamb.*—The value of the lambs' and weaners' wool is a factor to be taken into consideration by those who breed their own ewes; as to whether it is preferable to breed one's own half-bred mothers or to purchase them is a question which does not come within the scope of this article.

The value of the wool shorn from the ewe lamb is the first return. Wool values of the lambs bred at Walpeup were as shown in Table 2.

During the four years of the experiment Corriedale x Merino lambs have given the highest wool weight and value, although Border Leicester x Merino half-bred lambs, owing to greater length of staple, obtained the highest price per lb.

TABLE 2.—WOOL WEIGHTS AND VALUES—EWE LAMBS—AVERAGE FOUR YEARS—1940-43.

| Ewe Cross. | Weight lb. | Value per lb. | Value per Lamb. |
|---|---|---|---|
| | | *d.* | *s.* *d.* |
| Border Leicester x Merino .. | 2·1 | 12½ | 2 2¼ |
| Corriedale x Merino .. | 2·5 | 11½ | 2 4¾ |
| Dorset Horn x Merino .. | 2·1 | 11¼ | 1 11½ |

(*b*) *As a Weaner.*—If the young ewe is kept for a year before being mated, its return between shearings can be derived only from wool. Wool weights and returns are given in Table 3.

TABLE 3.—WOOL WEIGHTS AND VALUES—HALF-BRED WEANERS—AVERAGE THREE YEARS—1941-43.

| Ewe Cross. | Weight lb. | Value per lb. | Value per Weaner. |
|---|---|---|---|
| | | *d.* | *s.* *d.* |
| Border Leicester x Merino | 8·5 | 15½ | 10 11¾ |
| Corriedale x Merino .. | 9·4 | 14¾ | 11 6½ |
| Dorset Horn x Merino .. | 7·7 | 14¼ | 9 1¾ |

The Corriedale x Merino cross gave the highest wool returns per head both as a lamb and as a weaner.

(*c*) *As a Lambing Ewe.*—If the ewe (dry) fails to rear a lamb its sole return is from the wool, while the ewe (wet) which rears a lamb for slaughter has the return from the wool in addition to that from the lamb. Wool returns vitally influence the economic return from a particular cross and are set out in Table 4.

TABLE 4.—WOOL WEIGHTS (LB.) AND VALUES (PENCE PER LB. AND TOTAL)—WET AND DRY EWES—AVERAGE OF THREE YEARS—1942-44.

| Ewe Cross. | Weight | | Value per lb. | | Value per Ewe. | |
|---|---|---|---|---|---|---|
| | Wet. | Dry. | Wet. | Dry. | Wet. | Dry. |
| | lb. | lb. | *d.* | *d.* | *s.* *d.* | *s.* *d.* |
| Border Leicester x Merino .. .. .. .. | 7·1 | 8·9 | 15 | 16 | 8 10½ | 11 10½ |
| Corriedale x Merino .. .. .. .. .. | 9·3 | 9·4 | 14¼ | 15 | 11 0½ | 11 9 |
| Dorset Horn x Merino .. .. .. .. .. | 6·4 | 7·0 | 14¼ | 15 | 7 7¼ | 8 9 |

After the completion of lambing the dry ewes were cut out from the wet ewes and sometimes grazed for considerable periods on pasture inferior to that on which the wet ewes were grazed. Despite this, the dry ewes cut heavier fleeces of better quality wool than the wet ewes which reared a lamb.

Returns from wool are well in favour of the Corriedale x Merino ewe, while the Dorset Horn x Merino half-bred gave the lowest returns.

Experimental weighing of sheep at the Mallee Research Station.

Comments made by the valuer on the wool from wet ewes of the various crosses are of interest:—

For the season 1944 comments were as follow:—

Corriedale x Merino half-bred—Medium staple, fair bulk, some condition, dusty, average quality 58s./60s., approx. clean yield 56 per cent.

Border Leicester x Merino half-bred—Generally good length staple, very fair bulk, dry condition, light dust, average quality 56s., approx. clean yield 64 per cent.

Dorset Horn x Merino half-bred—Medium to short staple, thinly grown, dry condition, dusty, quality 58s./60s. approx. clean yield 54 per cent.

## Lambing.

(*a*) *Incidence of Lambing and Lambing Percentage.*—In each year lambing commenced close to the due date and a high proportion of the lambs were dropped within the first month. Such an early, concentrated lambing has the advantage of a greater possibility of an even lift of lambs early in the despatching season.

The data obtained so far in the experiment has suggested that the Dorset Horn x Merino half-bred ewes lambed a little earlier than the ewes of the other crosses. A good percentage drop of lambs was obtained from each of the different crosses, but lambing percentages were lower in maiden ewes.

On the average, the Dorset Horn x Merino half-bred gave the highest lambing percentages, but no general conclusions on this aspect can be drawn from results in three years only.

The possibility of obtaining the drop of lambs earlier than mid-April has not been investigated as it is thought that, particularly from the feed point of view, a drop at this time is sufficiently early for Victorian Mallee conditions.

(*b*) *Birth Weights of Lambs.*—Twins have been excluded from the calculations of birth weights given in Table 5.

Lambs from the Border Leicester half-bred ewes have given the highest birth weights and, generally, the wether lambs have weighed more than the ewe lambs.

TABLE 5.—BIRTH WEIGHTS (LB.) OF LAMBS—EWE TRIAL—1944.

| Breed of Lamb. | Male. | Female. | All Lambs. |
|---|---|---|---|
| | lb. | lb. | lb. |
| Dorset Horn x (Border Leicester x Merino) .. .. | 10·8 | 9·6 | 10·0 |
| Dorset Horn x (Corriedale x Merino) .. .. .. | 9·5 | 8·7 | 9 1 |
| Dorset Horn x (Dorset Horn x Merino) .. .. .. | 8·9 | 9·4 | 9·2 |

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those produced by the Dorset Horn half-bred ewes, while in 1943 there was little difference between them.

The weights of all lambs in 1942 and 1944 were far greater than in 1943 when ewes and lambs were hand fed for a considerable period.

Although the rainfall was very poor in 1944 it was possible by the grazing of crops to produce lambs comparable to those in 1942.

(*c*) *Lamb Weights.*—During the period it was not possible to weigh the lambs as often as was desired, but Table 6 gives an indication of comparative weights at various periods of the lamb's growth.

In 1942 and 1944 lambs from the Border Leicester half-bred ewes were heavier than

(*d*) *Lamb Grades and Values.*—The price schedules used in calculating the values in Tables 7 and 8 of this report are the same as set out in Table 9 of the report of the Sire trial, being the values for lambs "on hooks" in the seasons 1942 and 1944.

The grades and values of lambs during the experiment are set out in Table 7.

TABLE 6.—COMPARATIVE WEIGHTS OF LAMBS AT DIFFERENT PERIODS OF THE YEAR.

| | 1942. | 1943. | 1944. |
|---|---|---|---|
| | lb. | lb. | lb. |
| June. | 18th June | 14th June | 27th June |
| Dorset Horn x (Border Leicester x Merino) .. .. | 37·4 | 25·9 | 40·4 |
| Dorset Horn x (Corriedale x Merino) .. .. .. | 34·9 | 25·9 | 34·0 |
| Dorset Horn x (Dorset Horn x Merino) .. .. | 37·1 | 30·4 | 36·2 |
| July. | 31st July | 8th July | 31st July |
| Dorset Horn x (Border Leicester x Merino) .. .. | 63·8 | 34·7 | 60·3 |
| Dorset Horn x (Corriedale x Merino) .. .. .. | 59·9 | 32·0 | 50·4 |
| Dorset Horn x (Dorset Horn x Merino) .. .. | 63·2 | 37·2 | 53·0 |
| August. | | 6th Aug. | 31st Aug. |
| Dorset Horn x (Border Leicester x Merino) .. .. | .. | 41·1 | 80·7 |
| Dorset Horn x (Corriedale x Merino) .. .. .. | .. | 39·4 | 69·8 |
| Dorset Horn x (Dorset Horn x Merino) .. .. | .. | 44·7 | 71·3 |
| September. | 3rd Sept. | 22nd Sept. | 9th Sept. |
| Dorset Horn x (Border Leicester x Merino) .. .. | 82·5 | 60·1 | 82·8 |
| Dorset Horn x (Corriedale x Merino) .. .. .. | 74·0 | 54·7 | 72·4 |
| Dorset Horn x (Dorset Horn x Merino) .. .. | 79·5 | 60·1 | 76·8 |
| October. | 3rd Oct. | 4th Oct. | |
| Dorset Horn x (Border Leicester x Merino) .. .. | 90·0 | 68·2 | .. |
| Dorset Horn x (Corriedale x Merino) .. .. .. | 84·4 | 58·3 | .. |
| Dorset Horn x (Dorset Horn x Merino) .. .. | 87·8 | 65·7 | .. |

TABLE 7.—GRADES AND VALUES OF LAMBS FROM EWES MATED TO DORSET HORN RAMS—1942 TO 1944.

| | Dorset Horn x (Border Leicester x Merino). | | | | | | Dorset Horn x (Dorset Horn x Merino). | | | | | | Dorset Horn x (Corriedale x Merino). | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1942. | | 1943. | | 1944. | | 1942. | | 1943. | | 1944. | | 1942. | | 1943. | | 1944. | |
| Number of lambs slaughtered | 12 | | 22 | | 30 | | 15 | | 31 | | 28 | | 5 | | 21 | | 22 | |
| Average frozen weight | lb. 43·4 | | lb. 28·3 | | lb. 38·4 | | lb. 41·0 | | lb. 26·8 | | lb. 33·9 | | lb. 39·4 | | lb. 24·2 | | lb. 32·2 | |
| Percentage frozen weight to live weight | % 48·2 | | % 41·5 | | % 45·5 | | % 46·7 | | % 40·8 | | % 44·1 | | % 46·7 | | % 41·5 | | % 42·7 | |
| Quality and Weight— | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. |
| | | lb. | | lb. | | lb. | | lb. | | lb. | | lb. | | lb. | | lb. | | lb. |
| First Quality D | .. | .. | .. | .. | 1 | 28·0 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| First Quality 2 | 1 | 32·0 | .. | .. | 4 | 32·2 | 2 | 36·0 | .. | .. | 19 | 33·6 | 1 | 32·0 | .. | .. | 16 | 32·2 |
| First Quality 8 | 3 | 39·7 | .. | .. | 17 | 38·9 | 6 | 40·0 | .. | .. | 6 | 37·7 | 3 | 38·7 | .. | .. | 2 | 37·5 |
| First Quality 4 | 8 | 47·1 | .. | .. | 6 | 44·7 | 6 | 44·7 | .. | .. | .. | .. | 1 | 49·0 | .. | .. | .. | .. |
| Second Quality D | .. | .. | 1 | 25·0 | .. | .. | .. | .. | 2 | 26·5 | .. | .. | .. | .. | 3 | 26·3 | 1 | 26·0 |
| Second Quality 2 | .. | .. | 4 | 32·0 | 2 | 33·0 | 1 | 35·0 | 4 | 30·0 | 2 | 31·5 | .. | .. | 1 | 29·0 | 2 | 33·0 |
| Second Quality 8 | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 37·0 | .. | .. | .. | .. | .. | .. | .. | .. |
| Second Quality 4 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Third Quality L | .. | .. | 9 | 24·6 | .. | .. | .. | .. | 18 | 24·8 | 1 | 23·0 | .. | .. | 13 | 24·5 | 1 | 27·0 |
| Third Quality O | .. | .. | 8 | 30·9 | .. | .. | .. | .. | 5 | 30·8 | .. | .. | .. | .. | .. | .. | .. | .. |
| Reject | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 20·0 | .. | .. | .. | .. | 4 | 21·0 | .. | .. |
| | s. d. | | s. d. | | s. d. | | s. d. | | s. d. | | s. d. | | s. d. | | s. d. | | s. d. | |
| Average value of carcass 1942 schedule | 21 1 | | 12 9 | | 19 4 | | 19 0 | | 12 9 | | 17 9 | | 19 10 | | 11 5 | | 16 9 | |
| Average value of carcass 1944 schedule | 23 10 | | 14 3 | | 21 6 | | 22 7 | | 13 8 | | 19 3 | | 22 1 | | 12 1 | | 18 3 | |
| Average skin value | 4 0 | | 3 3 | | 3 0 | | 4 0 | | 3 3 | | 2 9 | | 4 0 | | 3 1 | | 2 10 | |
| Total value of lamb 1942 schedule | 25 1 | | 16 0 | | 22 4 | | 23 0 | | 16 0 | | 20 6 | | 23 10 | | 14 6 | | 19 7 | |
| Total value of lamb 1944 schedule | 27 1 | | 17 6 | | 24 6 | | 26 7 | | 16 11 | | 22 0 | | 26 1 | | 15 2 | | 21 1 | |
| | % | | % | | % | | % | | % | | % | | % | | % | | % | |
| Percentage of First quality carcasses | 100 | | Nil | | 93·3 | | 93·3 | | Nil | | 89·3 | | 100 | | Nil | | 81·8 | |

Small feeding trials at the Mallee Research Station.

### *Combined Wool and Lamb Returns*

The gross return from the ewes of each cross is composed of the values of wool—from both "wet" and "dry" ewes—and the lamb returns. The figures which are given in Table 9 are the gross returns per 100 ewes of each cross and have been calculated on a basis of 75 per cent. of single lambs from each type of ewe. This percentage, in the absence of more conclusive figures of the relative prolificacy of the various crosses, is an average of the total number of ewes in the trial which reared lambs, all lambs being credited as singles. Maiden ewes were included in the first two years of the trial, and the percentage is therefore lower than it would have been using older ewes only, as will apply in the remaining years of the investigation.

TABLE 8.—WEIGHTS, GRADES, AND VALUES OF LAMBS SIRED BY DORSET HORN RAMS—COMBINED TABLE—1942 AND 1944.

| | Ewe Cross | | | | | |
|---|---|---|---|---|---|---|
| | Border Leicester x Merino. | | Dorset Horn x Merino. | | Corriedale x Merino. | |
| Number of lambs slaughtered .. | 42 | | 43 | | 27 | |
| Average frozen weight .. .. | 39·8 lb. | | 36·4 lb. | | 34·8 lb. | |
| Percentage frozen to live-weight .. | 46·3 % | | 45·0 % | | 43·4 % | |
| | Number. | Average Weight. | Number. | Average Weight. | Number. | Average Weight. |
| | | lb. | | lb. | | lb. |
| Quality and Grade— | | | | | | |
| First D .. .. .. | 1 | 28·0 | .. | .. | .. | .. |
| First 2 .. .. .. | 5 | 32·2 | 21 | 33·8 | 17 | 32·2 |
| First 8 .. .. .. | 20 | 39·0 | 12 | 38·8 | 5 | 38·2 |
| First 4 .. .. .. | 14 | 46·0 | 6 | 44·7 | 1 | 49·0 |
| Second D .. .. .. | .. | .. | .. | .. | 1 | 26·0 |
| Second 2 .. .. .. | 2 | 33·0 | 3 | 32·7 | 2 | 33·0 |
| Second 8 .. .. .. | .. | .. | .. | .. | .. | .. |
| Third L .. .. .. | .. | .. | 1 | 23·0 | 1 | 27·0 |
| Third O .. .. .. | .. | .. | .. | .. | .. | .. |
| Reject .. .. .. .. | .. | .. | .. | .. | .. | .. |
| | *s. d.* | | *s. d.* | | *s. d.* | |
| Average value of carcass—1942 schedule | 19 10 | | 18 6 | | 17 4 | |
| Average value of carcass—1944 schedule | 22 2 | | 20 5 | | 19 0 | |
| Average skin value .. .. | 3 3 | | 3 2 | | 3 0 | |
| Total value of lamb—1942 schedule .. | 23 1 | | 21 8 | | 20 4 | |
| Total value of lamb—1944 schedule .. | 25 5 | | 23 7 | | 22 0 | |
| | % | | % | | % | |
| Percentage of first-grade carcasses .. | 95·2 | | 90·7 | | 85·2 | |

TABLE 9.—GROSS FINANCIAL RETURNS PER 100 EWES—THREE YEARS 1942-44.

| Ewe Cross (from Yearlings to 3-year-old Ewes). | Wool from Dry Sheep. | Wool from Wet Sheep. | Total Wool Return. | Value of Lambs. | Gross Return. | |
|---|---|---|---|---|---|---|
| | | | | | Per 100 Ewes. | Per Head. |
| | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. |
| Border Leicester x Merino .. | 14 16 10 | 33 5 8½ | 48 2 6 | 85 0 0 | 133 3 6 | 1 6 8 |
| Corriedale x Merino .. .. | 14 3 9 | 41 8 1 | 55 11 10 | 71 17 6 | 127 19 4 | 1 5 7 |
| Dorset Horn x Merino .. | 10 8 9 | 28 10 4 | 38 19 1 | 78 2 6 | 117 1 7 | 1 3 5 |

It is seen that under the conditions of the trial the Border Leicester half-bred ewe has given the highest returns from lambs and the highest aggregate from lambs and wool. The Dorset Horn cross produced more valuable lambs than the Corriedale cross, but its wool return is the lowest of the three ewe types, resulting in the lowest aggregate. As set out in Table 9, this expression of the results assumes equal prolificacy from each type of ewe, and so probably under-estimates the true return from the Border Leicester and Dorset Horn half-breds, as compared with the return from the Corriedale cross or Comeback type ewe. With a comparative increase in the value of the Comeback type of wool, or a fall in lamb values, the Corriedale x Merino type would show to better advantage, but there are many possibilities in changes of price levels which would effect the comparative returns from the different crosses.

The records of the investigation may be used to obtain relative values under the conditions prevailing at any particular time in the future.

### *Comparison Between Merino and Cross-bred Ewes*

The experiment was originally designed in 1939 to obtain comparisons between two different types of half-bred ewes and the Comeback type. However, strong wool Merino ewes from the western Riverina or from north-eastern South Australia are often available to Mallee farmers. With the object of obtaining some comparisons between half-breds and Merinos, a line of Merino lambs was bought in 1940 and were thus of comparable age to the first drop of cross-bred lambs at the Mallee Research Station. These ewes have been run with the cross-breds ever since their purchase. The wool cut from the Merinos has been approximately ½ lb. per head less than that obtained from the Corriedale-Merino cross. The prolificacy of the Merino and Corriedale x Merino ewes has been similar but was lower than it was in the Border Leicester and Dorset Horn half-bred ewes.

Lambs from the Merino ewes have made slower growth than those from any of the half-breds, and, at slaughter, have graded out a much lower percentage of first grade carcasses. The live-weight—dressed-weight ratio is lower in the lambs from the Merino ewes than from the half-bred groups.

Results obtained from ewes of comparable ages in 1942 and 1944 are set out in Table 10.

TABLE 10.—COMPARISONS OF MERINO AND HALF-BRED LAMBS.

| Lambs. | Dressed Weight. | Precentage Live Weight to Dressed Weight. | Percentage First Grade. |
|---|---|---|---|
| | lb. | % | % |
| Dorset Horn x (Border Leicester x Merino) .. .. | 40·2 | 46·6 | 96·7 |
| Dorset Horn x (Dorset Horn x Merino) .. .. .. | 38·1 | 46·0 | 95·8 |
| Dorset Horn x (Corriedale x Merino) .. .. .. | 35·7 | 45·0 | 84·5 |
| Dorset Horn x Merino .. .. .. .. .. | 33·6 | 44·4 | 77·0 |

Crossbred flock grazing on stubble at the Research Station.

The results indicate that, for the Mallee farmer who mates ewes for fat-lamb production, best returns would be obtained from a cross-bred or Comeback ewe.

Wool comparisons are an important factor in determining the type of sheep that is kept and are of vital importance in comparison of Merinos and half-breds. Wool weights and valuations from the Merino groups were kept for the duration of the experiment. As approximately 50 per cent. of the half-bred ewes were younger than the Merinos, the latter were not included in Table 4, which gives the wool returns from the half-breds. The wool returns from the Merino group over the three years were as follows:—

Wet ewes 8.1 lb., wool average valuation 13 pence per lb.—8s. 11d. per head average, while the dry ewes produced 8.5 lb. wool at an average valuation of 13¾ pence per lb.—10s. 1d. per head.

The wool returns per head of the Merino ewes which reared a lamb were thus approximately the same as obtained from the "wet" Border Leicester—Merino half-bred, but were not as good as obtained from the Corriedale—Merino half-bred.

Present day valuations may not be as favourable to the Merino as at times in the past, but it is difficult to forecast future price differentials.

The results therefore indicate that, at present day valuations, the keeping of strong-woolled Merino ewes for fat lamb production would give a lower gross return per head than would be obtained from a good line of half-bred or Comeback ewes.

## *Summary*

Investigations were commenced in November, 1941, at the Mallee Research Station, Walpeup, with the object of comparing the value as fat lamb mothers of half-bred ewes, Border Leicester x Merino, and Dorset Horn x Merino, and of the Corriedale x Merino, which is a Comeback type cross ewe.

The method of experimentation and seasonal conditions during the period of investigation are described.

The Corriedale x Merino half-bred ewe gave the greatest wool returns as a lamb, as a weaner and as a lambing ewe. Wool returns from each cross are tabulated.

The incidence of lambing was very concentrated and early for all breeds (April-May) and gave a good possibility for an early lift of lambs.

The lambing percentages were very even although those of the Dorset Horn half-bred ewes were generally higher than those of the other two crosses.

Lambs from the Border Leicester half-bred ewes had the greatest birth weight and, in general, wether lambs weighed more than ewe lambs.

Lambs from the Border Leicester x Merino half-bred ewes generally weighed more than the lambs from the other groups. Detailed results are given in the tables. Seasonal conditions were reflected in the weights year by year.

The Border Leicester half-bred ewes produced the highest percentage of first grade carcasses.

Merino ewes, when compared with half-bred ewes of a similar age, produced lambs that made slower growth during the year and were of a less desirable export conformation.

Lambs from the Border Leicester half-bred ewes gave the greatest return per head. This greater return more than counterbalanced the higher wool return obtained from the Corriedale x Merino ewe.

Assuming equal lambing percentages in each group, the Border Leicester half-bred ewes gave the highest gross return of combined wool and lamb values. The Corriedale x Merino ewes gave higher returns than the Dorset Horn half-bred ewes by virtue of the greater wool values per head.

[*Continued on page* 288.

# Efficiency in Use and Control of Irrigation Water . . Maffra Competition

Report by J. A. AIRD, B.Sc., B.Agr.Sc., Dip.Com., State Rivers and Water Supply Commission

"The question of the future of Australia is the water question. The people are but the nominal and not the real rulers of the continent until they can settle the water problem." So spoke Alfred Deakin, great Australian statesman, who was largely responsible for the early development of irrigation and water conservation in Victoria. The position has not varied greatly since then. One of the ways in which the water question can be met is by obtaining greater efficiency with the water available.

REALIZING the truth of the above, the Maffra Agricultural Society decided this year to again co-operate with the State Rivers and Water Supply Commission in holding a competition for "the farm with the most efficient use and control of water."

The area for which the competition was held comprises those portions of the Maffra Sale Irrigation and Water Supply District known as Newry, Tinamba, Riverslea, and Boisdale. Entries were received from all of these sections. The alluvial soils in these areas are among the most fertile in Victoria and need only an adequate supply of water to give luxuriant growth and high carrying capacity. The irrigation water for the district is obtained from the Glenmaggie Weir which is fed by the Macalister River.

The efficiency of water in irrigation may be considered from the standpoint of the percentage of water supplied used by the plants or by the returns obtained per unit quantity of water.

The first of these methods of comparing efficiencies was used in a series of tests carried out by the Agricultural Experiment Station in the State of Utah, U.S.A. In these experiments careful measurements were first made of the moisture content of the top three feet of soil; the water was then delivered and measured, and the water content of the soil was again determined. From the three measurements—moisture in the soil before irrigation, moisture after irrigation, and water delivered, calculations were made of the percentage of the irrigation water remaining for the use of the plants. In some cases the results showed that as little as one-fifth of the water delivered to the farm remained in the soil available to the plants, the balance was lost by surface drains, deep percolation, and evaporation. The highest percentage recorded as retained for the plants was 58 per cent. and the average 35 per cent.

The main factors contributing to the low water-application efficiencies were excessive applications of water, uneven distribution of water over the land, excessive moisture-content of the soil before irrigation or a combination of these factors.

Mr. R. S. Harper, B.Agr.Sc., Officer in Charge, Horticultural Research Station, Tatura, recently carried out on a number of tests on water penetration at Cobram. The results, set out in the February, 1945, issue of this Journal, show the varying rates of soakage in different soil types and the necessity for varying rates of irrigating. In one soil, water after six hours had soaked to a depth of over 4 ft. 6 in., and in consequence was not available to the majority of plants. If, in light soils, water can be lost after six hours irrigation, how much more must be lost when irrigation is continued for twenty-four hours, as it frequently is.

These tests at Cobram and the investigations in Utah clearly show that, to get efficiency in use of water it is essential that the period of irrigation be limited to the time necessary to supply water sufficient to wet the top 3 ft. of soil.

The second way in which the efficiency in the use of water could be measured would be by determining the production per acre-foot of water supplied to the soil.

The difficulty with this method is to get comparative production. For example, how can the production of a dairy farm, a sheep farm, or an orchard be compared? However, in the case of farms engaged on the same type of agriculture, comparisons are possible. An investigation of this type is being made in the Rochester district where the butterfat produced per acre-foot of water used is being calculated for a number of farms.

In the Maffra District competition, the method adopted was not to measure efficiency as described above, but to judge it by comparing the methods used to ensure efficiency.

Undoubtedly to use water efficiently it is necessary to have sound methods of water application, facilities for draining excess water, particularly when heavy summer rains immediately follow irrigation; provision for watering stock; and a method of recording water delivered and how it is used.

Points therefore, were allotted as follow:—55 for irrigation, divided into 25 for methods of irrigation and layout of property; 15 for methods of controlling water such as structures, and 15 for cleanliness of channels.

Twenty-five points were allotted to drainage facilities and cleanliness of drains, and of the balance of 20, 10 to provision of water for stock and 10 for records kept of water used.

The "layout" of the farms for irrigation was generally good and steps taken by many farmers to take water to isolated parts of their holdings reflect credit on them. As shown in the photographs, flumes have been built across billabongs and fillbanks built across depressions so as to irrigate every acre possible. In

Flume over billabong constructed by Mr. H. J. Hallows to irrigate part of his holding.

Outlet from settler's main channel to "toe" channel.

order to save the sides of the fillbank what is called a "toe" channel is frequently used. This is a small channel just above the surface which is supplied at the side of the depression and running along parallel to the main farm channel, supplies the land in the depression. In districts where it is not usual to empty channels between irrigations, this method could not be used as "yabbies" would soon pierce the bank and cause leakage. However, in the Maffra district, this difficulty has not to be overcome. Cleanliness of channels varied but there were none of the "cumbungi" and "rush" infested channels seen in some other districts. In some cases however, grass was growing thickly enough to hinder flow. On account of the greater fall, however, channels do not need to be as large as in northern irrigation districts, nor are grasses the same hindrance to flow. However, as will be seen from the points allocated, there was considerable difference in the cleanliness of the channels.

When, however, one turns to the methods used to control water in the channels and its release from them it is surprising that more has not been done. In no case had permanent outlets been made from the channel to the "bays" and, in a number of cases, earth and the shovel were the only means of offence and defence. As has been stated previously, earth washes readily and each time a channel bank is opened valuable soil is lost. Bag stops have been suggested

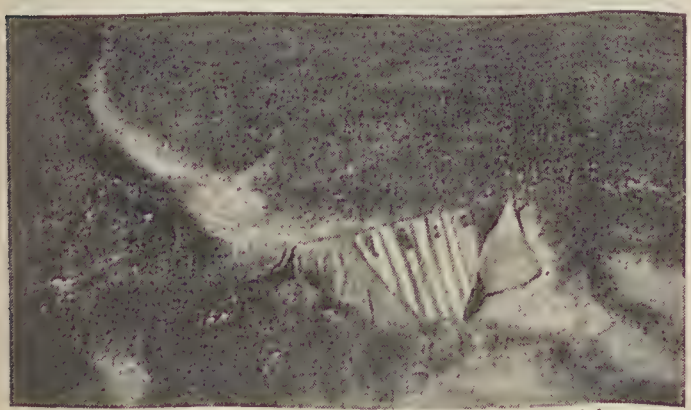
for use as temporary checks in new channels. In the Maffra district, an improvement on this is made by nailing a piece of sheet iron to a cross-piece and laying this across the channel and using a bag at each end to seal it, as shown in the illustration. This method has an advantage over the "bag stop," in that it is lighter, needs fewer bags, and lasts longer than the bag stop. However it is only a temporary device and permanent stops and outlets of concrete or wood are advisable. Competitors had various types of these "stops" in use. Most of these, however, are built-in where they are to remain, requiring the mixing of concrete on the spot with the shovel—a laborious task. It seems that, until the manufacture of concrete checks and outlets in bulk, either by a private firm or the State Rivers and Water Supply Commission, the work and trouble involved in making them will prevent their general use.

Freshly-graded land on Mr. R. G. Singleton's Riverslea property.

In the Maffra district, certain areas have good underground drainage, in so far as they are underlaid by gravel layers at comparatively shallow depths. Even in these areas however, some provision is necessary for the occasional heavy summer storm after an irrigation, or for long continued winter rains. Drainage of the district generally is facilitated by the depressions along old watercourses. In some cases these give direct access to the river, and in others provide basins which hold excess water until it disappears by seepage and evaporation. In one case use was made of excess water by pumping for irrigation. Travelling around the district there seemed to be a number of places where this could be done although, owing to the cost of pumping, the saving would not be considerable.

Among the competitors provision for watering stock was generally satisfactory, and in some cases excellent. Owing to the underlying strata of gravel mentioned above excavated dams will in many places not hold water and other methods of supply are needed. These are usually provided by means of bores and wells, windmills and tanks, and troughs. The supply to the various paddocks is made either by pipe or by separate installations. The Maffra-Sale district is ahead of other irrigation districts in the type of trough used. These are usually of concrete, long enough and wide enough to give cattle plenty of room to drink.

The water Commission urges the necessity for records to be kept by the irrigator of the quantities of water delivered and how it is used. The value of keeping a diary of farm operations has also been emphasized. However, the keeping of records is more conspicuous by its absence than its presence. Among the competitors one kept a diary of farm operations, one kept records of dates and quantities of water delivered, the area and type of crop irrigated, and one kept a record of date of delivery and area irrigated only. The other entrants kept no records at all but depended on the water bailiff. While it is realized that this reflects great credit on



Temporary check constructed of galvanized iron and bags.

the integrity of the bailiff it it considered that irrigators should keep records for comparison between seasons.

The competition, as the scale of points below shows, was won by Mr. R. G. D. Singleton, of Riverslea, who should be specially complimented, as in competitions of this kind, the large land holder is usually at a disadvantage compared to the man with the small compact area. Second prize was won by Mr. Theo. Kingscott, of Tinamba. Both of these farms are a credit to their owners and are worth inspecting.

The points scored by those of the twelve entrants who obtained over 60 per cent. were as follow:—

EFFICIENT USE AND CONTROL OF WATER COMPETITION, MAFFRA DISTRICT.

The Awards.

| Competitor. | Area Acres. | Water Supply. | | Cleanliness of Channels. | Drainage. | Water Supply for Stock. | Record of Waterings. | Total. |
|---|---|---|---|---|---|---|---|---|
| | | Layout. | Structures. | | | | | |
| | — | 25 | 15 | 15 | 25 | 10 | 10 | 100 |
| Singleton, R. G. D. .. | 550 | 25 | 12 | 12 | 22 | 7 | 8 | 86 |
| Kingscott, Theo. .. | 57 | 25 | 12 | 13 | 15 | 8 | 8 | 81 |
| Pearce, E. J. .. | 86 | 25 | 12 | 10 | 15 | 10 | 5 | 77 |
| Donohue, L. .. .. | 41 | 25 | 10 | 12 | 15 | 8 | .. | 70 |
| Gilder, F. (Manager, F. Lea) .. .. | 224 | 20 | 5 | 10 | 20 | 10 | .. | 65 |
| Olney, F. H. .. | 157 | 25 | 8 | 10 | 15 | 7 | .. | 65 |
| Lambrecht, C. .. | 156 | 25 | 8 | 15 | 10 | 5 | .. | 63 |
| Hallows, H. J. .. | 113 | 25 | 8 | 10 | 10 | 6 | 2 | 61 |
| Marks, N. E. .. | 134 | 20 | 5 | 5 | 20 | 10 | .. | 60 |

## FAT LAMB RAISING IN THE MALLEE—*continued from page 284.*

Relative returns from the crosses for any set of values may be obtained from the results of the investigation.

The investigation is to be continued to include the returns from five matings with Dorset Horn rams for fat lamb production, and to obtain more definite information regarding the relative prolificacy of each type of ewe. Results so far indicate the superiority of the Border Leicester x Merino cross ewe over the three other types investigated, viz., Dorset Horn x Merino, Corriedale x Merino, and the strong-woolled Merino.

# Orphan Lambs

Where seasonal conditions permit and the sheep are sufficiently strong to rear lambs, every effort should be made to induce ewes whose lambs are born dead or die soon after birth to adopt orphans. As a consequence, extra lambs are reared under natural conditions instead of dying or being brought up as pets.

A ewe which is kept in a small pen or yard with an orphan lamb can usually be induced to accept it if the lamb is helped to suckle a few times, but a more effective method is tying the skin from the dead lamb upon the back of the one to be adopted.

The alternative method is to rear the orphan lambs as pets and, if sufficient milk is available and adequate care is taken, healthy lambs can be raised quite successfully.

Cow's milk is not too rich for lambs and need not be diluted by the addition of water. The milk should be warmed to blood heat and is usually fed from a bottle with a nipple attached. For the first day or two lambs should be fed from two to four tablespoons of milk every four or five hours. As the lambs become bigger the amounts of milk can be increased and the number of feeding periods gradually reduced to two or preferably three a day.

Warm sleeping quarters should be provided and the lambs should be allowed access to pasture as soon as they will eat it.

[Contributed by the Live Stock Division.]

# "PITTING" POTATOES

By G. H. MATTINGLEY, Potato Expert

THE best method of storing potatoes intended for table use is by means of holding them in "pits." By this means, loss in weight and wastage are reduced and the tubers may be retained for extended periods with the least possible deterioration in quality and condition.

Potato storage "pits."

In choosing a site for the pit, see that it is well drained. This is essential for the proper keeping of the potatoes. Consideration should be given to the site being conveniently placed to the paddock in which the potatoes were grown and its suitability as a location from which the potatoes will be loaded for market. For the comfort of those who will be bagging and grading the tubers, the pit should be placed in a sheltered position, if this can be arranged. This work usually has to be done in the open, sometimes in inclement weather.

A convenient width for the potato pit is from six to eight feet, and an effective way of framing this area is to plough inwards two parallel furrows so that the required width lies between them. The sods from the furrows act as checks which determine the size of the pile, while the furrows facilitate drainage. Logs or 6 x 1 hardwood planks set on edge are also suitable for forming the boundaries of the pit. The length of the pit will depend on the tonnage of potatoes to be stored; if the site chosen is suitable, the pit can be extended as desired.

The potatoes should be built up as steeply as convenient—an angle of about 45° is practicable. As the pit progresses, the sides and end of the heap should be covered with a layer of straw about four inches deep. A capping of straw placed across the ridge so that the ends overlap the straw at the sides will shed off any rain. Rye or wheat straw—or reeds where available—are preferable to oaten or barley straw, as they are not likely to consolidate and restrict the ventilation essential for safe storage.

The thatch may be secured against wind by a light covering of soil, or by rails or scantlings. If soil is used it should not be placed higher on the sides of the pit than nine inches from the top of the ridge on either side.

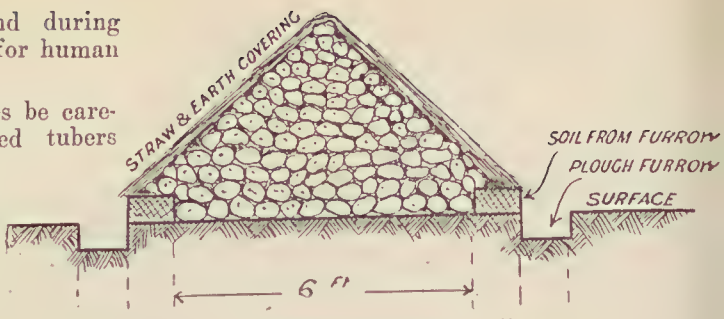
For small lots of one ton or less, the pit may be made with a circular base, and built up as high in the centre as the base will permit.

Only sound potatoes should be pitted, and it is important that growers contemplating this method of storage should know the chief causes of wastage, so that they may be avoided. Sweating and heating will occur if potatoes are stored in heaps so large that air cannot circulate between the tubers. The risk of loss from this cause is greatest with immature tubers, therefore, potatoes intended for pitting should be fully mature before lifting.

Rotting will probably occur in potatoes that have been pitted in a wet condition or which become wet during storage owing to inadequate cover. As potatoes are easily damaged by even a light frost, every precaution should be taken

to protect them after harvest and during storage. Frosted potatoes are unfit for human consumption.

It is highly desirable that potatoes be carefully picked over and all diseased tubers removed before they are placed in the pit. If diseased tubers are mixed with sound ones, the higher humidity within the pile favours the development and spread of the disease organisms to the surrounding healthy tubers.



Cross section of potato "pit."

# Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

| Name. | Address. | Name. | Address. |
|---|---|---|---|
| Abrahams, L. J. .. | Red Hill South | Haywood, Dr. A. R. .. | Hastings |
| Baker, J. J. .. .. | Bannockburn | Horn, L. A. .. .. | Leongatha North |
| Beechy, K. .. .. | Pomborneit | Jackson, Wm. C. .. | "Patterdale" Stud, Main Ridge |
| Bidgood Bros. .. .. | Staghorn Flat | | |
| Bodey, A. A. .. .. | "Bonnyview," Dooen | Longerenong College .. | Dooen |
| Bright, George H. .. | Dumbalk | Mundy Bros. .. .. | Orbost |
| Buller, R. A. .. .. | Beaconsfield | Noble, T. M. and Sons .. | Maffra |
| Castle, L. H. .. .. | Clarinda | Northcote Children's Farm | Bacchus Marsh |
| Dowie, Alexander .. | Mt. Moriac | Richards, Albert H. .. | Dumbalk, via Meeniyan |
| Critten, H. S. .. .. | Dumbalk | Rintoul, J. T. C. .. | Glengarry |
| Dookie Agricultural College | Dookie | Roy, W. A. .. .. | Morrell's Hill, via Boolarra |
| Doornbusch, John L. .. | "Starpark," Nhill | State Experiment Farm | Rutherglen |
| Cox, H. H. .. .. | Jacaranda Stud, Leopold | Trenery and Sutherland .. | "Promview," Foster |
| Ellwood, A. H. .. | Paschendaele | Trigg, A. J. .. .. | Bungaree |
| Fairchild and Clutterbuck | Tinamba | Trigg, N. H. .. .. | Bullarook |
| Hamblin, A. T. and Sons | Toolleen | Tweddle, J. T. .. .. | "Winlaton," Shepparton |
| Hardinge, B. and Sons .. | Nar Nar Goon | Warry, A. and Sons .. | Delburn |
| Harrison, C. T. .. | "Eastside" Stud, Pomborneit | Whelpton, B. .. .. | Whittlesea North |
| Hawton, I. E. and F. .. | "Rossmoyne," Colac | White, G. W. .. .. | Boolarra South |

# SOIL CONSERVATION

## Competition in the Goulburn Catchment Area

Report by R. G. THOMAS, M.Agr.Sc., Technical Officer, Soil Conservation Board, and W. D. ANDREW, M.Agr.Sc., Agrostological Research Officer, Department of Agriculture

Typical grazing and cultivation country in the Lower Goulburn region, showing contour furrowing and contour cultivation.

HAVING seen some of the benefits resulting from soil conservation competitions held in New South Wales, Mr. H. Hanslow, a Commissioner of the State Rivers and Water Supply Commission, in 1941 donated a silver cup to the Soil Conservation Board, as a trophy for perpetual annual competition for the best effort at soil conservation by landholders in the Goulburn River catchment area. This particular area was chosen because of the need to prevent excessive erosion on the areas feeding the Goulburn and its tributary streams, in order to lessen both siltation of water reservoirs and flood damage along the lower reaches of the streams.

The importance of the Goulburn river system to Victoria may be gauged from the fact that this river system serves irrigation districts totalling one and a quarter million acres in which some three hundred and fifty thousand acres are irrigated annually, and contributes materially to the stock and domestic supply system serving the Mallee. It had been hoped to commence the competition during 1942 but the war situation forced a postponement, and it was not until this season that the competition commenced.

It is hoped now that the competition will stimulate interest in soil conservation, and bring about a useful exchange of ideas and knowledge between landholders. It can become a big factor in educating landholders to appreciate the true meaning of the term "soil conservation" as well as in encouraging them to engage in soil conservation practices. It is not always appreciated by landholders that soil conservation means nothing more nor less than putting farming on a practical basis of permanency. It is not, as is sometimes thought, the tying up of the soil and of soil products for use at some indefinite time in the future. The conception is rather that full use should be made of the soil and of

its capacity to yield products useful to mankind, provided always that in this process of production the soil be maintained; otherwise the process becomes impermanent. It follows that a farm on which soil conservation is practised is firmly based as a productive unit.

The work of judging the competition was undertaken with full appreciation of the fact that specific erosion control works are not necessarily essential to soil conservation; that the achievement of soil conservation by wise management of a property is possible and in such case the necessity for special erosion control works does not arise. Indeed, since the realization of the need for soil conservation is a quite recent development, it is obvious that in this first competition, those properties which have been consistently well managed and have suffered little erosion in the past, must necessarily be to the fore. There has been little opportunity as yet for landholders whose properties have been appreciably eroded to apply remedial measures, or for results to become apparent where such measures have been applied.

It is to be expected that positive efforts by landholders to restore eroded country will come into greater prominence as the competition proceeds and as the results of these remedial measures become apparent. The value of mechanical aids such as contour furrowing and water diversion over considerable areas in the catchment cannot be disputed; in many places they would be very helpful in the development of ground cover on "sheet" eroded country and in the control of active gullying.

In submitting comment on this year's competition with its emphasis necessarily on pasture development and management, the judges hope that those whose properties have been affected to an extent that necessitates drastic measures, will not be deterred from taking those measures, or entering the competition in the future.

### *The Goulburn Valley Catchment Area*

For the purposes of the competition the area embraced in the Goulburn catchment comprises the following:—

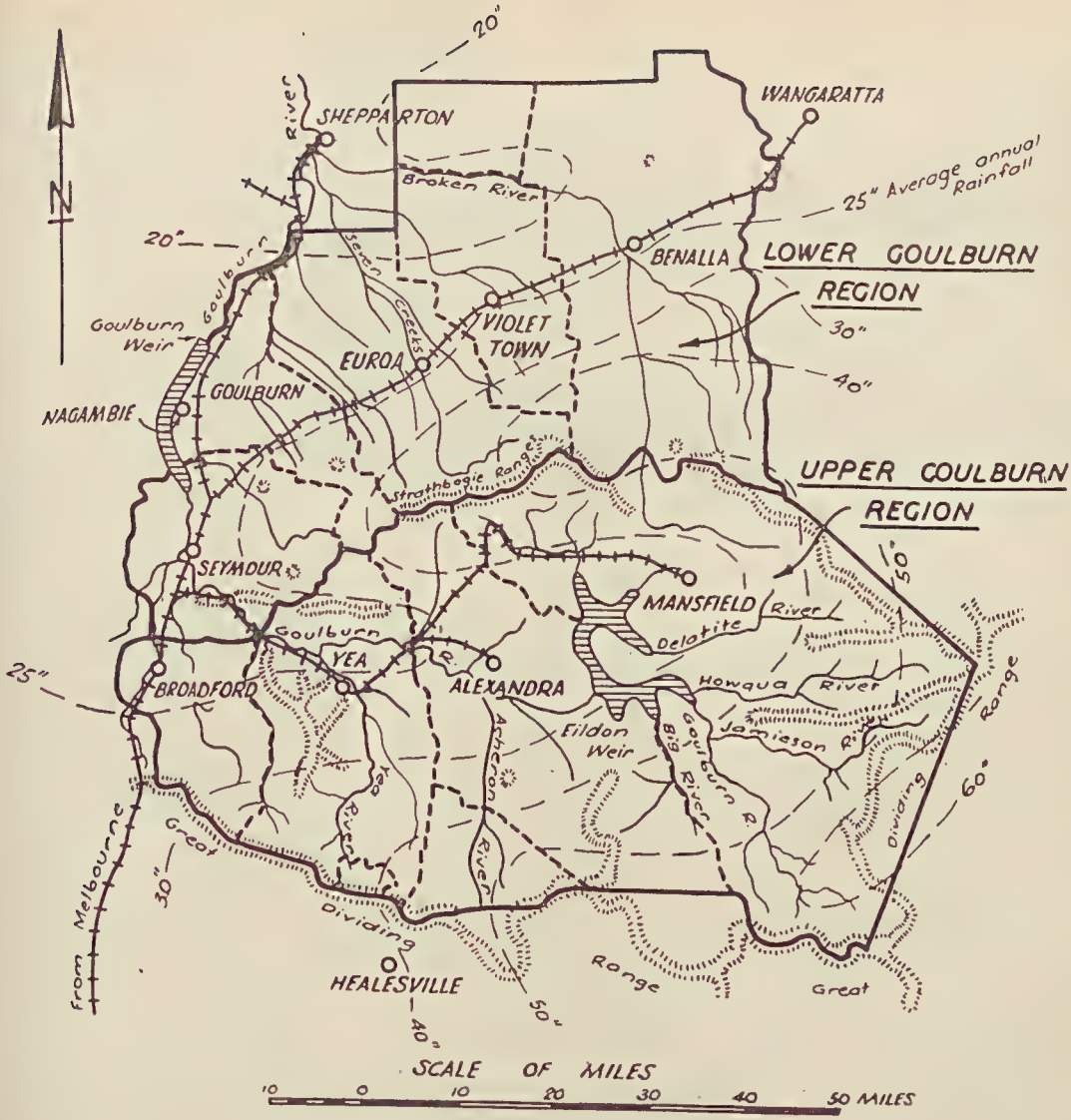
> The Shires of Mansfield, Alexandra, Yea, Broadford, Seymour, Goulburn, Violet Town, Euroa, Benalla, the parishes of Pine Lodge, Dookie, and Currawa in the Shire of Shepparton, and that part of the Shire of Healesville north of the Dividing Range.

The area contains two regions known as the Upper and Lower Goulburn Regions for which Regional Advisory Committees have been established under the Soil Conservation Act. The map shows the boundaries of the area, the principal towns, streams, and ranges. In this report, a brief description of the soils, topography, and land utilization of the area is thought desirable.

#### Topography, Soils, Climate.

The southern part of the area, coinciding largely with the Upper Goulburn region, is hilly country. It includes the northern slopes of the Great Dividing Range for a considerable length, the Strathbogie and other ranges. The hills are

Gentle slopes, adequate ground cover and feed, ample shade and shelter, characterize the "Seven Creeks" Estate, Euroa.




Map showing the area covered by the competition.

intersected by numerous streams feeding the Goulburn river, which here flows in a westerly direction. Further north, the country becomes progressively less hilly, until almost flat country is encountered along the lower reaches of the Goulburn and its northern tributaries. These plains are less than five hundred feet above sea level while the bulk of the hill country is between one thousand and two thousand feet, with considerable areas at higher altitudes.

The hills are principally of silurian sedimentary rock with some granitic formation and occasional volcanic outcrops, and the soils are residual soils formed by the decomposition of the parent rock. In contrast, the soils at the lower levels have been formed from the finer fractions of soil washed down from the high country and are generally very fertile. The predominant soil types in the hill country are shallow grey loam over yellow clay subsoil formed from the sedimentary rocks, a lighter grey sandy loam to sand over yellow clay of granitic origin, and a dark grey, sandy to clay loam of considerable depth along the river flats. The volcanic soils are deep, red, and friable. The soils of the plain country to the north are sedimentary in type and variable in character, but generally are suitable for cultivation.

Attractive home surroundings on the Euroa farm of one of the competitors, Mr. S. J. Bower

Differences in rainfall and climate throughout the area are considerable. The rainfall varies from under twenty inches per annum in the north-western corner, to over sixty inches per annum in the south-east. Quite a large percentage of the foothill country useful for agriculture and grazing receives the adequate rainfall of twenty-five to forty inches per annum. The higher country is subject to low temperatures, and for this reason the winter season is, in contrast to the northern section, the more difficult period for stock feed. The whole area is subject to dry summer and autumn periods and occasional severe rainstorms in those seasons.

**Types of Farming.**

Throughout the whole of the area live stock husbandry predominates, although large areas remain under timber and a proportion is too rugged to allow grazing. Sheep are grazed over most of the plain and foothill country, sometimes in combination with cattle. In the more hilly parts on native pastures, they are principally kept for wool while fattening and fat lamb raising are commonly practised along the river flats and in the plain country. Cattle are kept for various purposes throughout the area. An appreciable amount of dairying is done along the river flats. Fattening of beef cattle is carried out mainly on the better pastures of the foothills and flats. Small areas are cultivated along the river flats for crops such as maize, millet, and potatoes, but cultivation is extensive only in the north, where wheat and oats are grown. Many areas now devoted entirely to pasture were, however, formerly cultivated, usually for the production of oats for hay and grain. In more recent times, meadow hay has been chiefly relied on to provide a reserve of fodder for livestock.

**Erosion in the Area.**

The whole area is affected by erosion to a varying extent. Wind erosion occurs on some hill-tops and hill-sides, particularly from stock camps, during dry periods. Erosion caused by water is, however, the main problem of the area and is of very general occurrence.

The principal forms in which this water erosion occurs are briefly explained as follows :—

Sheet erosion is the more or less even removal of the surface of the soil. This is the least obvious form of water erosion, the existence of which is often not realized by landholders until bare patches of considerable size develop. Sheet erosion is of general occurrence throughout the sloping lands of the catchment, but appears to be more common on the residual soils of silurian origin than on other soil types. The granitic soils appear to be less subject to the trouble ; this, no doubt, is due to their greater permeability, and helped by the gentler slopes usually associated with the granitic formation. Sheet erosion of grazing country is a frequent, often unsuspected, cause of reduction in carrying capacity. One competitor stated that the total carrying capacity of his farm has been reduced, despite a marked improvement in the carrying capacity over a large portion of the property. Sheet erosion over the other section is responsible for the reduction.

Gullying occurs when run-off water becomes concentrated and cuts down into the soil and subsoil. Gullying is common throughout the valleys of the catchment area and the gullies in many cases are extending up the hillsides, deepening as they go. Gullies are to be found on all soil types. The subsoil from both the sedimentary and granitic formations is most unstable and is readily moved when exposed to the action of water. On the soils of the valleys and the plains, deep gullies readily occur, once the surface cover and binding vegetation is removed.

"Tunnel" erosion is a form of erosion occurring in odd places through the sedimentary hills of the catchment, and particularly in the area between Violet Town and the Broken River. Underground watercourses are formed in the subsoil by water travelling through the subsoil

and emerging at lower levels. Clay carried out from the tunnels is deposited over the soil surface below the point of emergence. Tunnel erosion has been observed only on soils derived from sedimentary rocks, and where a fairly impervious soil overlies "sugary" yellow subsoil consisting of clay and buckshot. As yet little is known as to the causes and occurrence of tunnels.

Stream erosion is the rapid wearing away of the bed or banks (or both) of a stream, and is so obvious as to require no description.

The reasons why the Goulburn Catchment is so subject to erosion can only be briefly indicated. A good deal of the country which has been cleared and is now grazed, is so steep as to require very careful management if erosion is to be prevented. Again, many of the soil types, particularly those of silurian origin, readily become "caked" on the surface if the vegetation is removed and the soil is subjected to the direct action of the rain. Penetration of water then becomes very difficult and run-off and soil loss are correspondingly greater. The liability of the area to occasional heavy rainstorms during the dry late summer and autumn months is also a factor favouring erosion. Over all has been the failure to appreciate the necessity for soil protection when determining rates and types of stocking, and the influence of the rabbit in adding a load to the stock-carrying demanded of the soil.

### *The Competition*

Conditions of entry to the competition require that the farm be within the Goulburn Valley catchment area and be worked as a unit. Any type of farm is eligible. The winner of the competition holds the Hanslow Cup for one year and receives a trophy from the Soil Conservation Board. The Shire Councils of Shepparton, Broadford, and Euroa donated prizes for award to entrants within their Shires under conditions laid down by the respective Councils as to numbers of entries, &c. A special prize for this year was donated by Mr. Hanslow. This prize is to be awarded for outstanding work by an entrant other than the winner of the Competition.

On account of the great diversity of conditions within the areas from which entries might be received, no scale of points is laid down. The judges are required to take into consideration the general lay-out of a property; the provision made for the effective control and use of rain-water and the safe disposal of surplus water; the conservation of water, fodder, and timber; the farming or grazing practices observed insofar as they relate to the preservation of soil fertility; and the success achieved in preventing or minimizing erosion, bearing in mind the degree of liability to erosion on the particular property.

As the occurrence of erosion is directly related to the vegetative cover on the soil, the amount and type of cover remaining at the time of inspection becomes of major importance in assessing the efficiency of farm management as relating to the conservation of the soil.

The following entries were received:—

| Name. | Address. | Shire. |
|---|---|---|
| S. J. Bower .. | Euroa .. .. .. | Euroa |
| G. H. Chomley .. | "Killeen", Longwood .. | Euroa |
| R. C. N. Clarke .. | "Dropmore", Seymour .. | Yea & Goulburn |
| I. R. Currie .. | "Seven Creeks Estate", Euroa | Euroa |
| L. E. Dotter .. | "Happy Valley", Flowerdale | Yea & Broadford |
| E. L. Jeffery .. | Pine Lodge .. .. | Shepparton |
| M. E. Jeffery .. | "Clarendon Park", Molesworth | Yea |
| E. Jowett .. | "Clonbinane Park," Broadford | Broadford |
| R. F. Kelsall .. | Creighton .. .. | Euroa |
| J. H. Ross .. | Mansfield .. .. | Mansfield |
| G. B. Speirs .. | Euroa .. .. .. | Euroa |
| J. H. Sutherland | "Seaton Vale", Yarck .. | Alexandra |
| Tehan Bros. .. | "Flowerdale", Strath Creek | Yea & Broadford |
| G. S. and J. S. Wall | Gowangardie .. .. | Violet Town |

Left—A badly eroded area, at "Seaton Vale," Yarck, photographed, March, 1944. Right—The same area, in June, 1944, after contour-furrowing, top-dressing with "super." and sheep droppings, and sowing to rye grass.

A well-constructed concrete "drop" built by Mr. L. E. Dotter, Flowerdale, to prevent extension of an active gully.

The entries extend from Mansfield through the hill country to Broadford and as far north as Pine Lodge. The total area of the entries is approximately 28,000 acres. The Shire of Euroa is the only one in which the number of entries is sufficient to permit the award of a Council trophy. Inspection of the entries took place in April, during a prolonged period of drought conditions, which provided a severe test of farm management.

### The Awards

The Hanslow Cup was awarded to Mr. J. H. Sutherland, "Seaton Vale," Yarck. This competitor's property consists of approximately sixteen hundred acres of silurian country, and is used for grazing. It shows every evidence of careful management, and is relatively free from erosion in an area where erosion is very prevalent. Mr. Sutherland's farm is an example of a property which has been raised to a state of very high carrying capacity by top-dressing with superphosphate, and where an adequate proportion of grass in the pastures has been maintained. This type of pasture has been developed by grazing management—a policy of grazing cattle and sheep in combination at what is regarded as a safe rate of stocking; that is, a rate at which stock can usually be carried in the paddocks, without unduly depleting ground cover or having to depend upon large reserves of conserved fodder. This protects both stock and soil. Despite the phenomenally dry season being experienced at the time of inspection, an adequate vegetative cover remained over practically the whole of the farm. All stock were in excellent condition, and handfeeding had not then been resorted to.

Most of the improved pasturage on this property consists of subterranean clover and annual grasses. In one part, perennial rye grass is persisting but, in general, the soil and climate are unsuitable for this species, and a more appropriate perennial grass would be *Phalaris tuberosa*. Endeavour is made to periodically give each paddock in turn a spring season under cattle only. Hill paddocks sown to rye-grass are grazed by cattle only until the grass is established and then receive special care. Normally one improved paddock is surface worked and sown to oats each autumn to augment winter grazing. Cultivation is done with the "combine" only, and across the slopes.

Special erosion prevention works include the planting of willows along a creek running through the property, stonework on incipient gullies, and contour furrowing of some twenty-eight acres as a demonstration area under the direction of the Soil Conservation Board. A noticeable feature on this contour-furrowed section is the rehabilitation effected on a section that was previously tunnelled and badly sheet-eroded. Subsequent to contour-furrowing, the normal top-dressing of superphosphate was given, tunnels were broken in and sealed where furrows crossed them, and bare patches were given a dressing of sheep droppings, and sown to rye grass. An excellent growth of rye grass resulted and the area now appears to be safely held.

Pussy willows assist in gully control at Flowerdale.

The policy of carrying a fairly high proportion of cattle on this property has been deliberate and was begun with the idea of maintaining a reasonable grass-clover ratio in the paddocks. Mr. Sutherland contends that if he aims to carry his cattle in the paddocks, he may at times have to hand feed them, but there will at most times be adequate paddock feed for the sheep. This is sound practice, as cattle are easily fed when occasion demands, and a consequence is that vegetative protection of the soil is fairly well assured. That the practice is also satisfactory from the business point of view is evidenced by the fact that, at the time of inspection, the equivalent of almost two sheep per acre was being carried after turning off a full complement of quality lambs and fat cattle last season.

The Euroa Shire trophy was awarded to Mr. Ian R. Currie of "Seven Creeks Estate". This is a particularly well-developed and well-managed property. The carrying capacity has been trebled in recent years by the extensive use of superphosphate. Particular attention has been paid to the development of water supplies, and the provision of ample fodder reserves and adequate shade and shelter for stock. The cover remaining on the paddocks was generally ample both for stock feeding and for the protection of the soil. Conditions of soil and topography on this property are such, however, that the liability to erosion is not as great as in the case of some other entries.

Both cattle and sheep are grown and fattened on the property and a satisfactory proportion of grass has been maintained in the pastures. Such a high state of soil fertility has now been reached that Mr. Currie is faced with the alternatives of introducing into his pastures a perennial grass that will maintain a close sward and prevent the development of high fertility weeds, such as thistles and cape weed, or of cropping paddocks in rotation to "cash in" on the accumulated fertility.

The perennial grass that is most suitable for soil and climatic conditions at "Seven Creeks" is *Phalaris tuberosa*, and the most satisfactory method of introducing it would be to take off, say, two cereal crops, then work the land as early as possible, and sow 1 lb. of seed per acre on a well-prepared seed bed in the autumn.

A notable feature on the property is a quite extensive young pine plantation situated on the top of a granitic hill. This plantation has been established with the two-fold purpose of bringing about increased absorption of water on the hilltop and thus a lessened run-off on the slopes below. At the same time it is growing into a valuable asset.

Other special works on the property include diversion banks designed to protect a roadway, and a further series now under construction designed to divert water from an active gully. Considerable stonework along gullies has been carried out with a fair measure of success.

The special prize was awarded to Mr. L. E. Dotter of "Happy Valley," Flowerdale. This competitor made a particularly meritorious effort. His property lies on either side of the King Parrot creek. The flats have been brought to a high state of production and the hillside country is now being cleared of bracken and brought into full production. Bracken is brought under control by top-dressing and frequent mowing. The carrying capacity of the flats has been raised to five sheep per acre, and the developed portion of the hillside country to approximately two sheep per acre. Some contour furrowing of this hillside country is contemplated by Mr. Dotter to enable more rapid and safer development of the area.

Special erosion prevention works include the construction of well-made cement drops at the heads of gullies (which had become active when the natural cover had been removed from the hillside), and the successful planting of willows and poplars along the banks of the creek, and for shade and shelter. Those farmers who think that soil conservation can only be a hobby for large landholders would find much to interest them on Mr. Dotter's property.

### Comments on Other Entries.

Other entries show evidence of careful management, and in several cases special erosion prevention works have been undertaken. The general standard of attention to such matters

Fodder reserves on a Euroa competitor's property.

as fencing, water supplies, and other improvements is good. A few competitors hold adequate fodder reserves, but in this respect most properties reflect the severity of the past two seasons.

Messrs. Tehan Bros.' "Flowerdale" property at Strath Creek, is perhaps outstanding in showing the improvement in carrying capacity, and maintenance of protective vegetation on the soil, that is possible under difficult conditions by reason of effective control of rabbits and safe stocking. On account of war conditions, little "pasture improvement" has yet been possible on this property since it was taken over by Messrs. Tehan Bros., but an improvement in the condition of the pasturage has occurred and is due primarily to the practical elimination of rabbits. This has been followed by rational grazing practices. The number of sheep in each paddock is adjusted according to the feed available and the rate of stocking on the hill country is reduced throughout the summer. Usually all stock are removed from the steepest hill paddocks in the summer months and until the autumn growth has commenced. It is apparent that the vegetative cover on formerly bare areas is improving as a result of these measures. Efforts are being made to treat "tunnelled" country by breaking down the tunnels and giving a heavy application of farmyard manure to encourage growth of pasture. Contour furrowing has been successfully carried out on a small catchment feeding three gullies.

Mr. S. J. Bower, of Euroa, has successfully constructed a stone and cement wall across a formerly active gully. As a result the gully is largely silted up. Ample fodder reserves are carried and vegetative cover on the flats is good. One paddock is carrying a nice stand of *Phalaris tuberosa*, a grass which is likely to attract considerable attention in north-eastern districts in the future. This competitor runs dairy cattle on the flats and sheep on the higher grounds, and is another example of a one-man farm run on sound lines.

Mr. R. C. N. Clarke's "Dropmore" property shows good cover throughout and evidence of careful grazing management, but here again the liability to erosion is not considered to be as great as on other properties entered.

Mr. J. H. Ross, Mansfield, has done good work along a gully through his property and in arresting the extension of bare patches caused by sheep camping near the hilltops. These patches appear to be covering up as a result of top-dressing and careful grazing management. In places small furrows cut across the bare patches have had a beneficial effect. A small area has been contour-furrowed.

On the "Killeen" property of Messrs. G. H. Chomley and Sons at Longwood, Mr. C. M. Chomley pays special attention to water supplies and fodder conservation. Incipient gullying along the diagonal headlands of a former cultivation paddock has been arrested by forming a series of banks to divert water away from the headlands.

An excellent demonstration of pasture improvement brought about by the development of early flowering strains of subterranean clover can be seen on portion of Mr. R. F. Kelsall's property. This work has been done on very poor, "wire-grass" country, that, although flat, suffers from sheet erosion, and illustrates clearly the improvement in pastures and the erosion control that can be achieved by means of "sub." and "super." on this class of land.

Messrs. G. S. and J. S. Wall of Goorambat have embarked on the difficult task of treating badly "tunnelled" country by deep ploughing followed by contour-furrowing. Results from this work are not yet apparent on account of lack of rain, but the work should be watched with great interest by those concerned with this type of erosion.

### General Comment.

Most of the properties entered in the competition are in grazing country of an undulating to hilly nature. It is apparent on these properties that where appreciable erosion has occurred, extension of the damage can usually be prevented and, indeed, the damage often repaired, by special efforts on the affected areas. The special efforts may vary according to the degree of erosion that has occurred; where the damage is slight, modifications of grazing practices may suffice to effect a cure. There are, however, large areas through the Goulburn catchment which are suffering from appreciable erosion, and where some mechanical aid must be adopted if rehabilitation is to be achieved within a reasonable time and without closing the areas to grazing. The mechanical aid that appears most useful for this purpose is contour-furrowing, a practice which aims at allowing absorption into the soil of all the rain that falls. The few areas seen which had been contour-furrowed show evidence of the value of this practice in enabling the recovery of areas affected by sheet erosion and in preventing water running off into gullies. It may also prove to be of more general

[*Continued on page 317.*

# Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

### *Rice Hay and Rice Straw*

QUANTITIES of rice hay and rice straw from the rice fields at Wakool, New South Wales, are being made available for stock feed through produce merchants. At present, samples are being analysed, and feeding trials are being conducted by the Department of Agriculture to give more information on the food value and palatability of these fodders. The results of these trials will soon be available, and persons requiring information on the subject should write to the Director, Victorian Department of Agriculture, Melbourne, C.2.

Rice hay and rice straw have been fed in large quantities to live stock in other countries, where it has been found that well-cured samples have food values approximately equal to those of the hays and straws from the other cereals. In this country under the present wet conditions, however, it will be difficult to cure this hay and straw.

Rice grain is very hard and, if it is not ground, even horses are apt to pass it undigested. When ground it is as nutritious as the other grains.

Rice hulls are practically valueless as a fodder.

### *Feeding the Young Calf*

Scarcity of pasture and concentrates will make calf rearing a difficult job this year, particularly in non-irrigated areas north of the Divide. However, on farms producing butter-fat calves can be reared cheaply and well on skim milk and pasture, and, on farms producing whole milk, gruels made from concentrates can be used to replace all but 25 gallons of whole milk in the total ration fed during the first four or five weeks of the calf's life.

Where little milk is available and large quantities of gruel are fed, it is most desirable that the calves receive plenty of grazing on good fresh green pasture. Half a pound of pollard or finely ground wheat and half a pound of linseed meal, boiled in one gallon (10 lb.) of water to which one teaspoonful of ground limestone has been added, and which has been cooled to 90° F., provide an excellent meal for a six weeks old calf.

Gruels can be made from any of the following:—(1) Pollard or finely ground wheat; (2) Equal parts of pollard or finely ground wheat and linseed meal; (3) Equal parts of finely ground wheat and skim milk powder; (4) Skim milk powder; (5) Three parts of finely ground wheat, three parts of dried whey and two parts of good quality meatmeal. Of the above mixture table gruel No. 1 is the lowest in food value. One teaspoonful of limestone should be added to all gruels which do not contain a large proportion of skim milk or skim milk powder. The calf will do much better if gruels can be supplemented with a small amount of new or skim milk.

The average-sized calf should be given the following quantities in at least two feeds a day:—

| | Milk 3·5 per Cent. Butter Fat. (lb. per day.) | Gruel or Separated Milk. (lb. per day.) |
|---|---|---|
| First week .. .. | Up to 12 | .. |
| Second week .. .. | 12 | .. |
| Third week .. .. | 9 | 5½ |
| Fourth week .. .. | 6 | 11 |
| Fifth week .. .. | 3 | 16½ |
| Sixth to twenty-fourth week .. .. | .. | 22 |

As the calf grows, additional feed should be provided as pasturage or good quality hay.

## *Census of Live Stock*

The live stock statistics recently released by Mr. O. Gawler, Government Statist, show, at the 31st March, 1945, a decrease of all kinds of live stock. It is known that the position is much worse now and, even if seasonal conditions are favorable from now on, there will be further large decreases at the 31st March next year.

The following figures are for the numbers of live stock as at 31st March, compared with the previous year and the year with the highest total :—

| | 1945. | 1944. | |
|---|---|---|---|
| Horses .. | 253,782 | 277,662 | 552,053 (1915)* |
| Dairy cows and springing heifers | 925,307 | 938,384 | 987,676 (1936)* |
| All cattle .. | 1,903,110 | 2,013,033 | 2,091,246 (1936)* |
| Pigs .. .. | 296,232 | 337,878 | 350,370 (1901)* |
| Sheep .. | 16,457,101 | 19,220,457 | 20,598,201 (1942)* |

* The year with the highest total.

*Horses.*—Horse numbers have steadily declined since 1915, but the drop of 24,000 this year is abnormally large. This year there are 6,616 foals and although this figure compares favorably with last year's figure, it is totally inadequate to maintain a horse population of anything like 250,000 head and it is considered that many less foals will be born and reared this season. During the last twelve months 16,420 horses had died.

*Dairy Cows.*—Although the decline in dairy cows and springing heifers was relatively small (13,000) at the 31st March, it is significant and, in addition, there were 10,000 less heifers and nearly 17,000 less dairy calves. Losses of dairy cattle through slaughter for meat are still high and deaths resulting from the drought have increased considerably since the cold weather set in at the beginning of June.

*Pigs.*—Pig numbers have fluctuated greatly since 1901, when record numbers were kept in Victoria. The big drop of over 40,000 head since last year is due to the shortage of skim milk, barley, wheat, and pollard.

*Sheep.*—During the year ended 31st March, 1,158,493 sheep and lambs died. This figure is twice the normal number. In addition, 5,057,120 sheep and 4,187,113 lambs have been slaughtered for human consumption. Of the drop of nearly three million sheep, over one and a half million were breeding ewes and over one million were lambs under one year old. On account of the loss of these breeding ewes and lambs for subsequent replacement, and the losses of sheep particularly mated ewes since the census was taken, sheep numbers will show another big decline at the 31st March next year, and it will take three or four years to build up the flocks again.

## *Feeding of Sheep*

Letters are frequently addressed to the Department of Agriculture by correspondents who ask for information about the drought-feeding of sheep, but, unfortunately, during this year the term "drought-feeding" had a new significance. In former years, the term implied the provision of the most economical maintenance ration which could be fed to starving stock by feeding grains and other concentrates not normally used, or fodder transported from districts within Victoria which were unaffected by drought.

The drought, which fortunately has now broken, was so protracted and so widespread that fodder reserves are practically exhausted, and with supplies of grain so limited all live stock owners are desperately searching for any feeding stuffs which will help them to tide their stock over the winter months. Thus, competition is keen for any surplus foodstuff which appears on the market.

Plant growth is very slow during the winter, and if the break in the season does not occur until the cold weather has set in, as occurred this year, little nutriment can be obtained from the pastures until the spring.

In a year such as the present considerable mortality may occur among the sheep flocks. This is unfortunate because the world food situation is critical, and never before has the need for expanded production been greater.

Every sheep owner will strive to prevent his sheep from dying of starvation. When wholly hand-fed, sheep in low condition are best kept in a small well-sheltered paddock. The available food will then go further because energy will not be wasted by the sheep wandering over a large area looking for non-existent pasture, and the sheltered nature of the paddock will protect them from cold winds and driving rain.

Breeding ewes in low condition are a cause of greater anxiety to the sheep owner than dry sheep. In cold districts early pasture growth may be insufficient for stock owners to hold all their ewes and rear the lambs too. In such cases rather than destroy lambs in order to save the ewes, it would be preferable to offer surplus ewes to northern farmers who are now re-stocking.

Ewes with lambs at foot require protein in their rations, in order to secrete milk, but dry sheep can be maintained for long periods on foodstuffs low in protein. Short succulent pasture is rich in protein, and ewes which are suckling lambs therefore should be allowed to graze any such pasture available in preference to dry sheep.

[J. T. Kelly, B.Agr.Sc., Science Field Officer.]

### *Pigs*

The amount of pigmeat slaughtered in Australia in 1944 was 129,953 tons calculated as carcass weight. Of this quantity Victoria's contribution was 31,437 tons, or nearly one-quarter of the whole.

The average carcass weight of all pigs for Australia was 147 lb., and for Victoria 160 lb.

Although many Victorian farmers ceased pig-raising during the last few years when they changed from the sale of cream to the sale of whole milk, their place in the pig industry was filled by others who increased production largely by the use of wheat for pig feeding.

Since the supply of wheat became uncertain towards the end of 1944, many of those pig-raisers who relied largely on wheat have curtailed their pig breeding, and it is expected that this will be reflected in decreased numbers of pigs for slaughter in 1946.

The number of pigs slaughtered so far in 1945 is lower than that of the corresponding period of 1944, but in the early part or 1944 there was a carry-over of pigs whose slaughter as porkers was prohibited during the latter part of 1943.

[L. A. Downey, H.D.A., Pig Expert.]

### *Chicken Rearing*

The months of July, August, and September have always been considered ideal for the production of the strongest chickens, but ultimate success in producing the best laying stock depends largely on careful rearing of the chickens, especially during their early life.

Emphasis should be placed upon the necessity of having strong vigorous chicks which have been bred from sound and disease free stock.

There are several systems of artificial brooding of chickens, such as the battery, hot-water-pipe system, electrically heated hovers, and those heated by kerosene lamps. Those of the hover type, electrically operated, have given every satisfaction, especially from the point of view of simplicity of operation.

Ideal conditions in rearing are those in which the chickens are allowed out on open grass runs in front of the brooder house, and the subsequent rearing in colony houses on free range, as soon as they can do without artificial heat, which is, approximately, at four to six weeks of age, depending largely on the weather.

Brooders and brooder compartments should be thoroughly cleaned and disinfected before use, and the utmost cleanliness is essential in all subsequent operations. Rice hulls on the floor to a depth of one to two inches are ideal as litter for the chickens.

During brooding, chickens should be kept at the correct temperature for comfort, approximately 90° Fahr. for the first week. No thermometer, however, is as good an indicator as the chickens themselves. Their actions will tell at once whether they are comfortable or not. If comfortable they will rest contentedly just outside the source of heat; if not warm enough they will indicate the fact by their discontented chirping and crowding to the source of heat; if too hot they will get as far away from the heat as possible, or go around with their mouths open panting for breath. The temperature should be gradually lowered each week as the comfort of the chickens will permit, and the chickens should be allowed an abundance of fresh air. Clean conditions are essential.

[H. F. Clinton, Poultry Expert.]

### *Some Practical Hints for Apiarists and Others*

It is not wise to open up colonies during the winter months, although it may be necessary when a colony is short of stores. Introduce feed by placing full, sealed combs of honey immediately alongside the cluster. These can be drawn from colonies with plentiful supplies.

The painting and renovation of hive bodies and equipment can now be conveniently carried out. A 30-in. steel cramp is helpful when warped bodies are being re-nailed. The best

method of dealing with warped bodies is to place them in a steam vat. The ordinary honey liquefier-vat, fitted with a good cover, is ideal for this purpose. The bodies can be steamed in the empty vat by using the extracting boiler until the warp is softened. They may then be cramped and re-nailed.

Extracting equipment should be thoroughly scalded and dried, as the honey residue causes discoloration and, ultimately, rust. When the inside surfaces are thoroughly clean, tanks and extractors can be given a coat of hot beeswax. It is a good practice to heat the surfaces immediately beforehand with a blow-lamp, as this facilitates adhesion of the wax on to the metal. The wax will act as a rust and stain-repellent for a considerable time. All galvanized containers should be treated in this manner before being filled with honey.

Weather resistance of tents and canvas equipment can be greatly increased by the application of a mixture of beeswax and shellite, or pure petrol. Melt the beeswax and stir in enough petrol to form a liquid having the consistency of good paint. Apply on a warm day with an ordinary paint brush with the tent pitched.

Avoid rust on saws, chisels, planes, and other wood-working tools by applying the following mixture: four parts beeswax, one part resin. Melt together and add petrol to thin it down; usually about three-quarters of a pint of petrol is used to half a pound of beeswax. This preparation will protect tools for a long time, and may be removed by washing or wiping with petrol.

Paint brushes need attention and care, as they are hard to obtain. Brushes should never be placed in water when they are not to be used for a long period, but should be well washed out in turpentine or petrol, and dried thoroughly. An application of motor cup grease will keep the bristles in good condition for a long time, but the grease must be thoroughly washed out with petrol before the brushes are again used. A brush which has been allowed to harden may be softened by placing it in raw phenyle. If the brush has been neglected for a long period, it will take several changes of phenyle and some time to restore it to its original condition.

[W. A. Collins, Apiary Inspector.]

## *Arsenical Poisoning of Stock*

### Submission of Specimens.

The occasion often arises where a stock owner suspects the cause of death of an animal to be arsenical poisoning. In such cases a small sample of suspected fodder should be submitted for analysis, together with samples of liver, stomach, and paunch of dead animals. About 4 oz. of the fodder sample is sufficient. If the animal is a ruminant, the fourth stomach should be submitted intact, this being done by tying off both ends with tape or string. The sample of liver required is approximately two inches square; while a portion of the paunch wall about three inches square is sufficient for analysis. These samples should be submitted in a sealed container addressed to the Director, Veterinary Research Institute, care of Flinders-street or Spencer-street Railway Stations. The Director of the Veterinary Research Institute should be notified by telephone or telegram immediately the specimens are despatched. A note of warning is here given. Where stock die suddenly the cause is occasionally due to anthrax, in which case a post-mortem examination should not be conducted, as the operator is likely to become infected. As anthrax is a notifiable disease in Victoria, suspicious cases should be reported to the District Stock Inspector at once. If this is not possible, an ear should be cut off well down at the base and placed in a sealed tin, and forwarded as above with the additional precaution of labelling the tin "suspicious of anthrax". When removing the ear take care to see that the blood does not touch the skin or clothes, and that the knife is thoroughly disinfected, preferably boiled, immediately afterwards. The carcass should then be burnt.

[G. Nicol, B.V.Sc., Veterinary Stock Inspector.]

# War Agricultural Committee Notes

Compiled by the Central Executive

THE Eighth Conference of District Chairmen of the Victorian War Agricultural Committees was held in Melbourne on 16th and 17th May.

In his opening remarks to the Conference the Chairman of the Central Executive indicated that, with the increasing demand for greater production of foodstuffs, the work of the War Agricultural Committees in the future was likely to be concerned more with fostering the production of essential foodstuffs than with the control of man-power and materials. There was at present a world shortage of food, which was likely to remain until the countries of the world had returned to normal peacetime production. Australia must continue to produce to the utmost of her ability, and it was to this objective that the War Agricultural Committees must strive.

The Chairman then reviewed Victorian production for the first nine months of 1944-45, comparing it with production for the same period last year, and stressed the fine achievements of the producers in this State, despite one of the most severe droughts on record.

Changes in the war situation, as well as seasonal conditions, have brought about changes in the relative priorities of agricultural production. Thus, flax, potatoes, vegetables, dairying, and now cereal grain and hay, have all been high priority products at some time during the past five years, and it is hard to say just what product will be required most urgently six months hence.

### *Fodder Supplies*

The serious position in regard to supplies of fodder in Victoria was discussed at considerable length. The Senior Inspector of Agriculture outlined the present stock position and methods of control of sales. Supplies were now so short that it had been necessary to restrict the amount which merchants could deliver to the various regular priority groups. Any cereal fodder over and above the amount needed for regular clients should be distributed by merchants after consultation with War Agricultural Committees. Permits for sales between farmers could also be obtained for fodder needed to feed horses to be used for sowing cereal crops, by submitting application forms sponsored by War Agricultural Committee Chairmen.

The distribution of wheat supplies was also discussed, and the plans for the sponsoring of applications for a special wheat ration for working horses sowing cereal crops in the drought areas, were outlined.

Strong representations were made to the Fertilizer Control Officers that some provision should be made for additional supplies of superphosphate for the sowing of cereal hay crops in the more favoured districts of the State.

### *Man-power*

Representatives of the Man-power Directorate were present, and addressed the Conference on the many aspects of this subject. Regarding releases from the services for food production, it was indicated that, in general, the man-power position on farms has improved through the releases already made. However, the Commonwealth Government is at present reviewing the position, and it is possible that further releases for rural industries will be granted in the near future.

### *Agricultural Machinery*

The supply position of agricultural machinery has improved greatly during the past two years. Local production has increased considerably, and importations are higher than at any time during the war. It is anticipated that the demand for machinery for the coming harvest will be large, but it is expected that the improved supply position will meet it.

The greatest difficulty at the present time is the supply of tractors, particularly for the sowing of this season's cereal crops. Although the number imported to date is much greater than that imported during the same period last year, it is still far short of demand. However, the increased co-operative use of tractors on farms and the repairing of older models has assisted materially in overcoming the shortage of power for cropping.

Arrangements have now been made whereby farmers in drought areas requiring replacement tractor tires may have the old ones inspected in certain country centres instead of sending them

to Melbourne. In this way, the old tire can be held by the farmer until the new one is available. These arrangements, which are designed to reduce delays in delivery of tractor tire replacements to a minimum during the sowing season, will operate until 31st August. Future procedure will depend largely on their functioning during the trial period.

It must be realized that the number of tractor tires available is limited, and for this reason tires must be retreaded or repaired wherever possible.

### *Materials Supply*

The supply position of the main materials required by farmers has deteriorated badly. Galvanized-iron supplies are now well over twelve months in arrears. Orders for plain wire, placed nine to twelve months ago, and those for wire-netting, placed about fifteen months ago, are still unfulfilled. Supplies of piping are about six months in arrears. The shortage of man power, coupled with industrial troubles, are responsible for this unsatisfactory state of affairs.

# Tubercle-free Herds

ACCREDITED TUBERCLE-FREE HERDS.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

| Name. | Address. | Number in Herd. |
|---|---|---|
| Aboriginal Station | Lake Tyers | 109 |
| Armstrong and Son | Wangaratta | 105 |
| Ballarat Orphanage | Ballarat | 129 |
| Banyule Stud Pty. Ltd. | Wangaratta | 54 |
| Beggs, A. R. | Beaufort | 88 |
| Black, I. S. Estate | Mount Noorat | 60 |
| Clark, W. J. | Monomeith | 130 |
| Cowan, G. L. S. | Bacchus Marsh | 59 |
| Cribbes, T. | Wangaratta | 39 |
| Deering, J. T. | South Wangaratta | 61 |
| Dennis, Mrs. A. A. | Frankston | 23 |
| Dookie Agricultural College | Dookie | 85 |
| Foletta G. G. and Son | Buxton | 109 |
| Geelong Grammar School | Corio | 78 |
| Gorman, A. W. | "Cathcart," Alexandra | 57 |
| Griffin, G. W. | Gladysdale | 50 |
| Griffiths, J. G. | Benalla | 151 |
| Gross, Mrs. G. F. | Green Lake | 21 |
| Hamilton, A. | Flinders | 64 |
| Howlett Mrs. G., and Miss E. Samuel | Lang Lang | 55 |
| Jakobi, L. W. | "Granada," Yannathan | 89 |
| Johnson, F. G. | Horsham | 11 |
| Kane, F. E. | Warrnambool | 28 |
| Kilmany Park Farm Home for Boys | Sale | 105 |
| Lady Talbot Milk Supply Co. | Cranbourne | 489 |
| Lawrence, P. H. | "Rainga," Tarrawarra | 83 |
| Longerenong Agricultural College | Dooen | 42 |
| Maloney, P. J. | Tongala | 66 |
| Murray, M. G. | Lima | 26 |
| McNabb and Son, G. A. | Irrewillipe East | 159 |
| Nancarrow Bros. | Kerang | 47 |
| Noonan, G. | Benalla | 29 |
| Noonan, Mrs. S. A. | Benalla | 51 |
| Northcote Children's Farm | Bacchus Marsh | 165 |
| Onley, W. H. | "Glenholme," Caldermeade | 67 |
| Parker, Mrs. L. M. | Tallarook | 67 |
| Payne, A. E. T. | "Yarra View," Lilydale | 66 |
| Payne, T. E. N. | "Woodburn," Kilmore | 44 |
| Poole, M. A., and D. | Caldermeade | 120 |
| Poole, M. A., and D. | Yannathan | 104 |
| Powell, T. S. | "Carellen," Mansfield | 43 |
| Richardson, Bros., Messrs. | "Faldinghurst," Upper Beaconsfield | 53 |
| Roe, Thomas H. P. | Cobram | 27 |
| School of Horticulture | Burnley | 6 |
| State Experiment Farm | Rutherglen | 47 |
| State Research Farm | Werribee | 245 |
| Stephens, Dr. F. | Vermont | 32 |
| Vagg, T. R. | Officedale | 45 |
| Waterhouse and Son | Pakenham | 55 |
| Wells, W. G. | Caldermeade | 65 |
| Woodyer, P. A. | Mornington | 19 |

In addition to the above-mentioned herds there are 844 commercial dairy herds containing 22,144 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 331 herds in which 11,413 head of cattle have passed one test, and may be considered, therefore, to be in the process of becoming tubercle free herds.

# WILT DISEASE OF FLAX

By C. R. MILLIKAN, M.Agr.Sc., Plant Pathologist, Biological Branch

SINCE Bolley, in 1900, established the association between the fungus *Fusarium lini* and flax wilt, the disease has been recorded in practically every flax-growing country in the world (Anon. 1943). The frequent cropping of a particular area with flax has been found to render it "flax sick" (Lugger 1890, Bolley 1900, Anon. 1926). On such land, successful crops of susceptible flax varieties cannot be grown more often than once in every seven to twelve years (Lugger 1890, Barker 1923, Zybina 1926, Baylis 1940).

"Flax sickness" has sometimes been attributed to various fungi other than *F. lini*, namely, *Fusarium* spp., *Rhizoctonia* spp., *Thielaviopsis basicola*, *Macrosporium* sp., *Alternaria* spp., *Colletotrichum lini*, *Asterocystis radicus*, *Helminthosporium* sp., &c., (Kletschetoff (1925) (1930), Jaczewski (1928), Boyle (1934), Tervet (1937). It is clear, however, that *F. lini* is the primary cause of the disease (Bolley (1900), Flor (1940) ).

In view of the potential danger of wilt to the newly-established flax industry in Victoria, experimental work was commenced in 1942 to obtain information on the occurrence of the disease under Victorian conditions.

## *Occurrence in Victoria*

According to the records of the Biological Branch of the Victorian Department of Agriculture, *Fusarium lini* was first recorded in Victoria in 1913 on wilted flax from Drouin. In 1918 a further outbreak of the disease was reported in an unknown locality (Gordon 1919). At Drouin in 1939 and again in each of the seasons 1941, 1943 and 1944, severe wilt occurred on land which had been overcropped with flax. In other districts several minor instances of what appeared to be wilt have been observed, but in none of these cases has the disease been positively identified.

In Victoria, the disease does not become apparent until early October and later. As indicated below, this is due to the normal occurrence of temperature conditions unfavorable for the wilt fungus during the early part of the season.

Fig. 1—Wilt of Liral Crown flax seedlings.

## *Identity of Causal Organism*

Sub cultures of the fungi isolated from wilted plants from two crops were forwarded to Dr. W. L. Gordon, Dominion Laboratory of Plant Pathology, Winnipeg, Canada, who identified them as *Fusarium oxysporum* (Schlecht), *f. lini* (Bolley), Snyder and Hansen (= *F. lini*). The fungi belong to the Elegans section of the genus which puts them in the species *F. oxysporum*. Their pathogenicity to flax makes them "*f. lini*" of the species (Snyder and Hansen 1940).

In the following paper it is the above-named fungi which are referred to as *Fusarium lini* D1 and D2 respectively.

## *Symptoms*

Plants may develop symptoms of wilt at any stage of growth. In seedlings, the disease appears suddenly. First the edges of the cotyledons inroll and later the cotyledons collapse. At the same time, the stem becomes constricted

Fig. 2—Flax wilt symptoms in old plants. Sown in June. Symptoms appeared in November.

at ground level, and the plant falls over and soon withers, and usually completely decays in moist soil (Fig. 1). It is unlikely that these seedling symptoms will ever be noted in Victorian crops which are normally sown in the winter and experience sub-critical temperatures for wilt for several months after germination.

In older plants, the onset of the disease is usually spread over several days. The first symptom was often the occurrence of small, ill-defined dark green to brown spots on the leaves. The latter take on a yellowish or greyish-green dried up appearance, while the stem itself may remain green. These symptoms are soon followed by the drooping of the tip of the plant and of the leaves, and finally by death (Fig. 2). In contrast with the seedlings, older plants which have become woody, remain erect after death (Figs. 5 and 8). The dead leaves often fall off leaving the bare stem. The roots of affected plants appear normal, but the cortex of the stem at ground level is usually readily peeled off.

Where the disease appears very late in the season, the only symptom may be a premature ripening. However, affected plants, instead of yellowing off normally, take on a light to dark brown colour. In such cases, the whitish mycelium of the fungus can often be seen around the stem at ground level. The effect of this premature dying on fibre quality is at present unknown, but is being investigated.

Affected plants may occur in patches or may be scattered throughout the crop.

### *Effect of Soil Temperature on Flax Wilt*

The important role of soil temperature in determining the incidence of flax wilt has been investigated by a number of workers. During a study of the nature of wilt resistance in flax, Tisdale (1917) observed that the degree of resistance appeared to depend to a large extent on the environmental conditions under which the plants were grown. Plants of a resistant variety were found to be not so resistant under the high summer temperatures in the glasshouse. Later Jones and Tisdale (1922), at Wisconsin, found the optimum temperature for infection of flax by *F. lini* to be approximately 24° C. No infection occurred at 12° or 38° C., the critical temperatures being 14–16° C. and 34° C. Thus susceptible plants growing in soil maintained at a temperature under approximately 56° F. would escape the disease even though the parasite was abundant in the soil. Kikuchi (1940) claims that the optimum temperature for wilt development varies with the variety. The susceptible variety Riga, had an optimum of 26–30° C., whereas with the resistant variety Minami, the optimum was 30–33° C.

Grossmann (1934) has studied the effects of variations in soil temperature on the development of wilt. The varieties, Newland (susceptible) and Bison (resistant), showed the highest degree of infection at a soil temperature of 27° C. When germinated and grown for fifteen days at a temperature of 12° C., Newland soon developed severe wilt on being transferred to a high temperature. By contrast, Bison was found to contact the disease only when the temperature was raised immediately after germination—seedlings grown at 12° C. for fifteen days were resistant at all temperatures. However, Dillman (1936) has stated that while Bison is practically wilt free at moderate temperatures, it wilts somewhat at higher temperatures.

The critical temperatures set out above for the development of wilt disease, closely parallel those for the causal organism, *F. lini*. Tochinai (1925) gives the latter as minimum 10° C., optimum 28·5–29·5° C., maximum 37° C. Broadfoot (1926) found no differences in the radial growth of four strains of *F. lini* on the same medium at various emperatures.

Details of the experiments which have been made to determine whether the temperature relationships of the wilt disease of flax as it occurs in Victoria are similar to those reported in other countries, are described below.

Greenhouse experiments were conducted at Burnley, and field experiments at both Burnley and Drouin.

### (a) Greenhouse Experiments.

Method.—Soil was obtained from an area at Drouin on which a very severely wilted flax crop had grown in the previous year. The fungus concerned was identified as *Fusarium oxysporum f. lini* (= *F. lini* D1). This soil was set up in the Burnley soil temperature tanks and three experiments were made as under :—

*Experiment No.* 1.—The tanks were maintained constant at the following temperatures :—55°, 60°, 65°, 70°, and 75° F. Four pots in each tank were sown with Concurrent flax. The amount of wilt occurring in each series was recorded at frequent intervals until 50 days after germination, thus enabling the graph shown in Fig. 3 to be drawn.

*Experiment No.* 2.—Pots were sown with Liral Crown or Concurrent flax respectively and were maintained at 55° F. At varying periods after germination, namely, 7, 10, 15, 18, and 20 weeks respectively, four pots were transferred to a tank maintained at 75° F. and the subsequent development of wilt recorded.

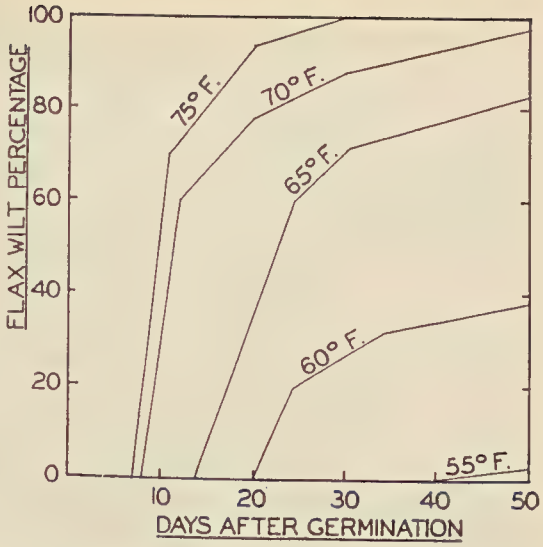



Fig. 3—Development of wilt in Concurrent flax grown in naturally infected soil maintained at the temperatures indicated.

*Experiment No.* 3.—The halves of two pots were sown with Bison and Concurrent respectively. These pots were maintained at a temperature varying from 8°–14° C. till fifteen days after germination, when they were placed in a tank maintained at 75° F.

### Results.

*Experiment No.* 1.—The rate of wilt development at the different temperatures is shown in Fig. 3.

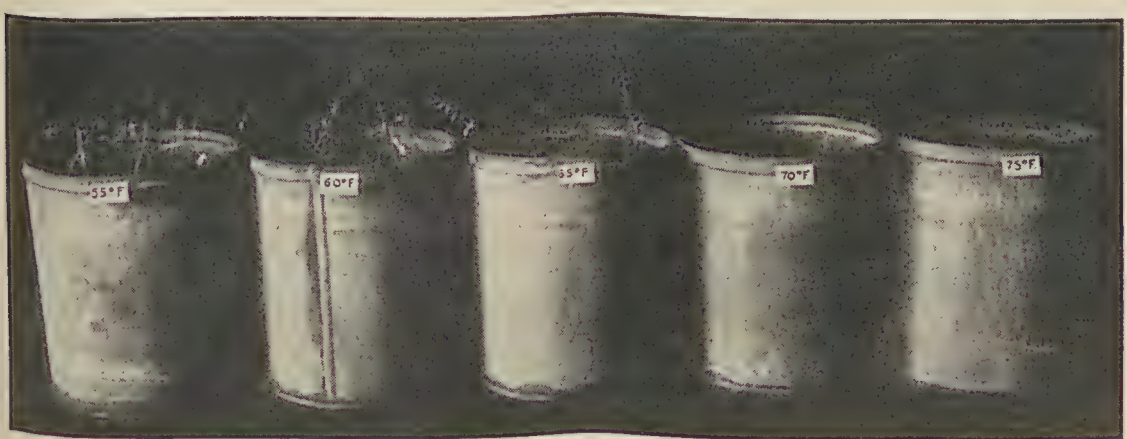



Fig. 4—Effect of temperature on the development of wilt in Concurrent flax grown in naturally infected soil.

Fig. 5—Concurrent flax plants grown in wilt infected soil maintained at 55° F. for ten weeks after germination. Pot on right then transferred to 75° F. At time of transfer all plants were apparently healthy. Photograph taken two weeks after transfer, when plants in the pot on right were badly wilted.

The appearance of a series of pots at the end of the experiment is shown in Fig. 4.

Wilt developed most rapidly and severely in the pots maintained at 75° F., and was practically absent in seven weeks' old plants grown in soil maintained at 55° F. This indicates that the minimum temperature for the disease is approximately 55° F., and that the disease is favoured by an increase in temperature up to 75° F., which results are in close agreement with those of Jones and Tisdale cited above.

*Experiment No.* 2.—The results of this experiment have shown that susceptible plants growing in naturally infected soil may escape the disease in their early life if the soil temperatures are below 56° F., but that such plants invariably become wilted if the soil temperature subsequently becomes favorable to the development of wilt at any time up to at least twenty weeks after germination. In each instance, wilt became very severe within two to three weeks after the transfer of the pot from the 55° F. tank to the tank maintained at the higher temperature of 75° F. The appearance of two pots from the ten weeks' series two weeks after the transfer is shown in Fig. 5.

*Experiment No.* 3.—The result of the experiment in which the Concurrent and Bison varieties were maintained at a sub-critical temperature till fifteen days after germination and then transferred to 75° F. did not support that of Grossman cited above. Within a fortnight of the transfer to the higher temperature, the Concurrent plants were 100 per cent. wilted, and Bison showed 50 per cent. infection. From that time on the disease became progressively more severe in the latter variety, until it was 100 per cent. infected five weeks after the transfer was made.

The results of the greenhouse experiments support the observation of Bolley (1901) that, "plants are attacked at all ages and die early or late in the stage of growth according to the time and intensity of attack".

### (b) Field Experiments.

From 1942 to 1944 inclusive, studies have been made on the effect of temperature on the development of wilt disease in flax grown in the open. This work was conducted both in the field at Drouin and in the "bird cage" at Burnley, using naturally infected soil from Drouin.

METHOD.—At Burnley, the "wilty" soil was placed in shallow pits 6 inches deep. Immediately adjacent to these areas maximum and minimum thermometers were set up at a depth of 2 inches and daily readings of soil temperatures at this depth were taken. At Drouin, a soil thermograph was installed on the property of Mr. G. M. Mitchell. The thermograph bulbs were placed at 2, 3, and 4 inches respectively below the surface of the ground. At each centre, and during each year, several sowings of Concurrent

flax were made at different times. The dates of germination were recorded, and the subsequent development of wilt in these sowings was estimated at frequent intervals.

Results.—The results of the 1943 experiment at Burnley are presented in Fig. 6.

These results are typical of those obtained in each season at both Burnley and Drouin.

The important influence of temperature on the development of wilt in flax is clearly indicated in Fig. 6.

In the months of January, February, and March, and again in October, November, and December, the soil temperatures were very favorable for wilt infection, and high percentages of infected plants occurred in sowings of flax during these months.

Soil temperatures began to fall from the end of March and from May to September were below the minimum for wilt infection. For this reason, the plants in sowing D, which germinated on 5th June, did not show any signs of wilt infection until the middle of October, after which date however, they developed a high percentage of disease.

In Victoria, the bulk of the flax crop is sown in late May or June, so that sowing D corresponds with the normal practice. The delayed appearance of wilt in sowing D thus corresponds with the observed natural occurrence of the disease in crops in Victoria, where wilt does not become apparent until early October and later.

The results of the temperature studies have shown therefore, that the occurrence of wilt in susceptible flax plants growing in infected soil is dependent solely on the prevailing soil temperatures. The age of the flax plant has little effect on the final severity of the disease.

### *Varietal Resistance Studies*

Although Broekema (1893) was the first to suggest the possibility of developing wilt resistant strains of flax, it was not until the classic work of Bolley from 1900 onwards, that much attention was given to the development of such wilt

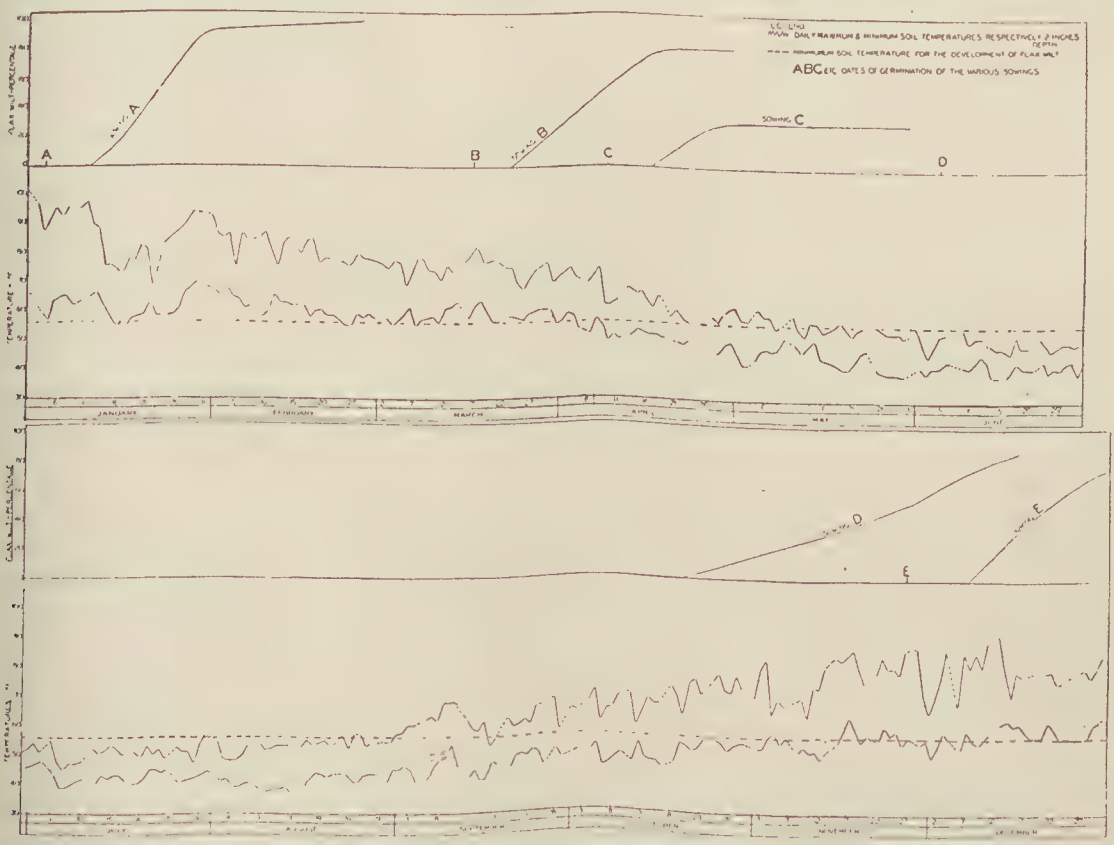



Fig. 6—Relationship between soil temperature and the development of wilt in sowings of Concurrent flax in infected Drouin soil at Burnley during 1943.

resistant strains. The method usually employed was to make an area flax "sick" by the frequent sowing of flax. This area was then used to test the resistance of varieties to the disease, and to select resistant strains. The method had limitations in that it was not possible always to control the temperature factor to provide optimum conditions for the development of wilt. This was shown by the observation of Tisdale (1917) that plants of North Dakota Resistant No. 114 were found to be not entirely resistant under high summer temperatures in the greenhouse. Later Barker (1923) also observed that resistant varieties may be injured severely by wilt if soil temperatures are high.

Another important factor to be considered is the occurrence of physiologic strains of *F. lini*. This aspect is discussed in more detail later in this paper.

As the two flax varieties grown extensively in Victoria, namely, Liral Crown and Concurrent were known to be very susceptible to wilt, numerous flax and linseed varieties were tested for their resistance to the form of *F. oxysporum f. lini* present in "wilty" Drouin soil. The primary object of this work was to endeavour to obtain highly resistant material for use in a breeding project designed to produce disease resistant flax varieties suitable for Victorian conditions.

In the first two seasons all the tests were conducted in infected soil obtained from the one area on Mr. G. M. Mitchell's property at Drouin. This was designated D1. However, following a severe occurrence of wilt in a crop on a different soil type at Drouin in December, 1943 (designated D2) comparative tests were conducted in D1 and D2 soils to determine if different physiologic strains were involved in the two types.

Seed of the varieties included in the tests was kindly supplied by Dr. J. Calvert and Mr. A. V. Hill, of the Council for Scientific and Industrial Research; Dr. I. A. Watson, University of Sydney; Mr. A. T. Pugsley, Waite Agricultural Research Institute; Mr. J. McCann, Department of Agriculture, Victoria; Mr. W. H. Poggendorff, Department of Agriculture, New South Wales; and Dr. J. J. Christensen, University of Minnesota, respectively.

## Method.

The varieties to be tested were grown in "wilty" Drouin soil maintained at 75° F. in the Burnley Temperature Tanks. Before sowing the varieties, the wilt infection of the soil was increased to a high level by a preliminary sowing of the susceptible Concurrent variety. After this was done, sowings of this variety would normally develop up to 100 per cent. wilt within twenty days of germination. The surface of the pots was divided into either two or four equal sections, and seed of the susceptible Concurrent variety was sown in one section for control purposes. Each of the remaining sections was sown with one of the varieties under test. The percentage of wilt in each variety was determined at frequent intervals until 50 days after germination.

## Results.

It was found that where the wilt infection of the soil had not been built up by a preliminary sowing of Concurrent, many of the varieties included in the susceptible class developed less wilt, and would, under such conditions, have been placed in a more resistant class. On the other hand, it was also found that after numerous sowings had been made in any one pot of "wilty" soil, there was a tendency for the resistance of varieties to break down. This break down of resistance may have been due to a depletion of plant nutrients in the soil, as the plants normally made much poorer growth than in the first few sowings. There appears to be little information as to the influence of nutrition on the development of wilt in flax.

In view of the above, the old soil was discarded after a maximum of two tests, and was replaced by fresh "wilty" soil. Inoculation of pure cultures of the pathogen into steam sterilized soil, followed by one or two sowings of Concurrent to build up the infection, often resulted in the development of a higher percentage of wilted plants in the test varieties than when the same varieties were grown in naturally infected soil.

The above observations are naturally of considerable importance in any pot experiment designed to classify the relative "wilt" reactions of different flax varieties. The conditions of such tests should be standardized as much as possible. The Concurrent controls which were sown in each pot along with the test varieties, provided a means of comparing the results from different pots. These control sowings, and many other varieties contracted wilt within 3 to 4 days of germination, and developed 100 per cent. infection within 10 to 25 days after germination. Such varieties were placed in Class 1. The wilted seedlings of these varieties usually rotted completely in moist soil. This was in contrast to the reactions of other varieties included in

Class 2, in which the initial rate of wilt development was slower, but which finally showed 80 per cent. or more of diseased plants. Examples of varieties showing the Class 2 type of reaction are Bison, Bolley's Golden Selection, Rio, Uruguay G 36/48, Seln. I.F. 812G 38/7, and Walsh (see Fig. 9). In this type, many of the plants became somewhat woody before wilting and remained erect after their death (Fig. 9).

The above observations are in accord with the experience of Barker (1923), who found that susceptible varieties usually developed 100 per cent. wilt within two weeks after germination. However, wilting could occur throughout the season—a few plants may be killed in the seedling stage and others following. This emphasizes the necessity for conducting wilt tests for a sufficient period to enable all susceptible plants to contract the disease.

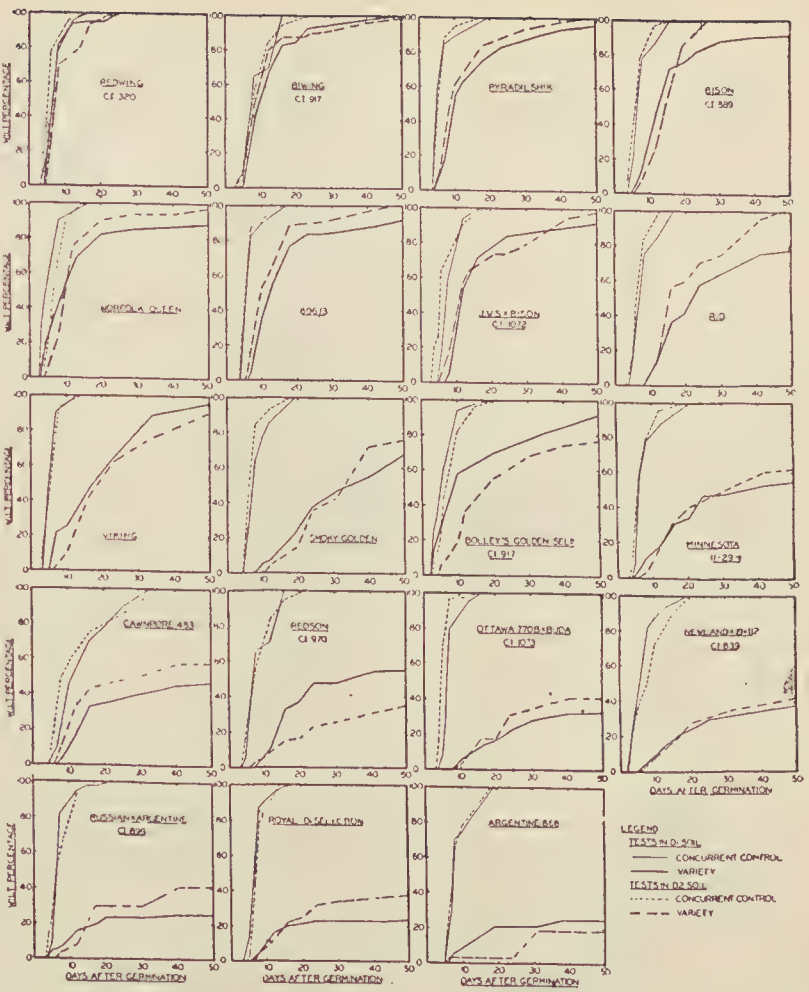



Fig. 7—Wilt reactions of flax varieties grown in two naturally infected soils (D1 and D2 respectively), maintained at a constant temperature of 75° F.

It was obvious that many of the varieties in Class 2 possessed some resistance to wilt. It is very probable that under the fluctuating temperature conditions less favorable to the disease, such as normally occur in the field in Victoria, they would show considerable resistance.

This underlines the warning given by Jones et al (1926) regarding the interpretation of temperature tank tests, that "the avoidance of hasty and unsound judgments has been, therefore, best insured in our experience through coupling field studies with those of the greenhouse". The importance of this aspect is further emphasized by the comparative results of field and temperature tank tests of wilt selections described later. Even two very susceptible varieties in Class 1, namely, Liral Crown and Concurrent, which show no differences in the temperature tank tests, exhibit a difference in the rate of wilt development in the field. Here the Liral Crown variety consistently develops the disease more slowly than Concurrent, although it finally may show up to 100 per cent. infection.

It is believed, however, that these temperature tank tests are of value as they do afford a means of discovering those varieties which possess outstanding wilt resistance.

With the above reservations, the classification of the varieties in accordance with their wilt reaction to *F. lini* D1 at the end of 50-day tests in naturally infected soil maintained at a constant temperature of 75° F. is set out hereunder. Those varieties which showed an identical reaction to *F. lini* D2 are italicized.

A liberal classification for the resistant classes has been made, as it was obvious that the risk of wilt infection in these tests was very much greater than that which would be experienced under a normal winter sowing in Victoria, when fluctuating temperatures, which are sub-critical for several months after germination, occur.

### Class 1.—Varieties which Developed 100 per Cent. Wilt within 25 Days of Germination.

Abyssinian C. I. 701, Abyssinian (brown-seeded Strangers) C. I. 36, Akmolinsk C. I. 515–1, *Alger*, Argentine type (large-seeded) North Dakota, *Beladi*, Blauwe Ster, Blenda, Blue Blossom, Blue Riga, *Buck 2*, *Calar*, *Caucasus*, *Caucasus K*, Cawnpore 1206, Certified White Dutch, *Cheljabinsk*, Chippewa, *Concurrent*, C.V.N., *C205*, *C207*, *Danubian*, DS 30 Dolgunetz, F55, *Fibre Selection*, Ford, Friesch Wilboei, Friesland, Giza, Giza Oil, Giza Purple, G.D.S. 4 Dolgunetz Hybrid, Hercules, Hindi, Indian, Indian (White), *Italian*, J.H.C., J.W.S. C.I. 708–1, Jogeva No. 76, Kenya (White-seeded strangers) C.I. 709–1, Latvian, Lin Ameliore, Linum marginale, Linum rubrum, Liral 2, *Liral Crown*, *Liral Crown Short*, Liral Dominion, *Liral Duke*, Liral Monarch, *Liral Prince*, *Martin*, Moose x N. Dakota 127 F119, *Moskov*, *New Morocco*, New Zealand, Newland C.I. 188, *Norfolk Earl*, Normandy, North Dakota 52, North Dakota 114, *Novelty*, *Palestina*, *Peruno*, Plate 115, Punjab C.I. 120, Punjab Californian Commercial, Punjab Type 5, Punjab Type 23, *Redwing C.I. 320*, *Stakhanovety*, Stormont Cirrus, Stormont Gossamer, *Tammes 766*, *Tammes 767*, *Tammes 768*, *Tammes 769*, *Tammes 770*, *Tammes 772*, T5 T8, T11 x A1–3 G39/21–1, T11 x A1–3 G39/21–3, T11 x A1–3 G39/21–7, Var. A 48, Var. 8063 Dolgunetz, Very Pale Blue Crimped C.I. 647–1, Victorian Commercial, Williston Brown C.I. 803–1, Williston Golden C.I. 25–1, Winter Flax (Bulgarian), Winterlein, Wonder.

### Class 2.—Varieties not Included in Class 1 which Developed over 80 per Cent. Wilt.

Argentine C.I. 690, Argentine C.I. 705–1, Argentine Seln. C.I. 462, *Bison C.I. 389*, (*Bison* x *Newland*) x (*479* x *Bison*) *C.I. 1080*, Bison x 479, C.I. 975, *Biwing*, C.I. 917, *Bolley's Golden C.I. 644*, *Bolley's Golden Selection C.I. 977*, Buda C.I. 270–1, Cawnpore 1150, Cawnpore 1193, *D83*, EB3, F6, *Hollandischer Faserflachs*, I.F. 808 G38/11, *J.W.S.*, *J.W.S.* x *Bison C.I. 1072*, *Ladjene*, Linkopis, Linum crepitans C.I.

Fig. 8—Reactions of four flax varieties to wilt in tests in naturally infected soil (D1) maintained at 75° F. Concurrent and Newland were almost 100 per cent. wilted. Bison finally developed a high percentage of wilt but more slowly. Newland x (19 x 112) was resistant to the disease under these conditions.

760, *Linum crepitans* (Germany), *Linum crepitans* (Spain), *Linum crepitans* (Ukraine), Linum monogynum, *Liral Crown* x *Bison C.245*, *Liral Prince* x *Bison C.252*, Long Fibre Linkopis, Malabrigo C.I. 696, *Mapun*, *Norfolk Queen*, Ottawa 770B C.I. 355, *Pinnacle C.I. 693*, Punjab Selection SB 39–2, *Pyradilshik*, Recolte No 0189, Recolte No. 0916, Riga Centrekspoort, Riga Crown, *Rio*, *Rota*, Selection I.F. 812 G38/7, Selection I.F. 22450/30 G36/12, *Textilshik*, Uruguay G36/48, Uruguay G36/49, Uruguay G36/52, *Viking*, *Walsh*, Walsh Y4681, *806/3*, 5126 B. 27.

CLASS 3.—60 TO 80 PER CENT. OF PLANTS WILTED.

*Bombay C.I. 42*, Blenda Y6178, *Kameniza*, *Lino de las Indias*, *Minnesota No. 11–30–52*, Moose x N. Dakota 127 F118, *Renew* x *Bison C.I. 1083*, *Rota D1 Selection*, Royal, Selection 5872 195 G38/9, *Smoky Golden*, *Sunagawa*, Superior, Triumph.

Fig. 9—Wilt reactions of flax varieties grown in naturally infected D1 soil maintained at 75° F. Note the complete susceptibility of Concurrent and Uruguay G 36/48. In the latter variety the disease appeared much later than in Concurrent. Russian x Argentine C.I. 896 was practically wilt free. Photographed 50 days after germination.

CLASS 4.—40 TO 60 PER CENT. OF PLANTS WILTED.

Argentine 189, *Cawnpore 483*, I.F. 810, Koto C.I. 842, *Minnesota No. 11–29–1*, *Redson C.I. 970*, *Tammes Pink 8*.

CLASS 5.—LESS THAN 40 PER CENT. OF PLANTS WILTED.

*Argentine 868*, *Newland* x (*19* x *112*) *C.I. 839*, *Ottawa 770B* x *Buda C.I. 1073*, *Russian Argentine C.I. 896*, *Saginaw* x *Bombay C.I. 671*.

The great majority of the varieties which were tested in both D1 and D2 soils have shown identical reactions.

However, certain varieties showed two different classes of wilt reaction as under:—

| Variety. | Class of Wilt Reaction. | |
|---|---|---|
| | D1 Soil. | D2 Soil. |
| Koto C.I. 842 .. .. | 4 | 2 |
| *Linum crepitans* C.I. 760 .. | 2 | 4 |
| Liral Prince Selection 7 .. | 2 | 4 |
| 5872 195 G38/9 .. .. | 2 | 5 |

Such results strongly suggest that *F. lini* D1 and *F. lini* D2 are distinct strains.

The object of the varietal resistance studies has been achieved in that, under the severe conditions of the tests, several varieties have proved to be highly wilt resistant. Of these Russian x Argentine C.I. 896, which is also immune to rust (*Melampsora lini*) (Waterhouse and Watson 1944), has been selected as the principal parent for a flax-breeding project designed to produce wilt and rust resistant flax varieties suitable for Victorian conditions (Fig. 9).

A test was made of the wilt reaction of Russian x Argentine in a normal winter sowing in naturally infected D1 soil in the field. Wilt first occurred in the control rows approximately 120 days after germination. At 150 days the wilt position was as follows:—

| Variety. | Wilt Percentage. |
|---|---|
| Concurrent .. .. .. | 99·8 |
| Liral Crown .. .. .. | 100 |
| Russian x Argentine C.I. 896 .. | 0 |

The above result confirmed the high wilt resistance of Russian x Argentine.

The second and concluding portion of this article, which deals with the selection of wilt-resistant strains of flax, will appear in a subsequent issue of this Journal.

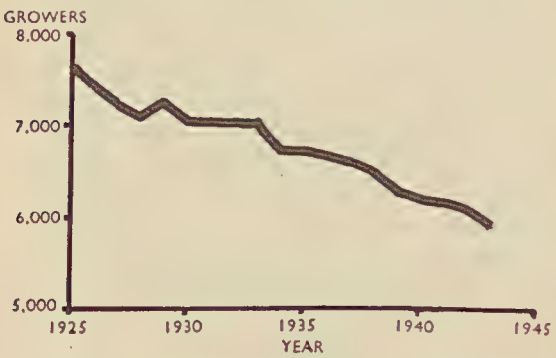
# ORCHARD NOTES

### *Fruit Industry Statistics*

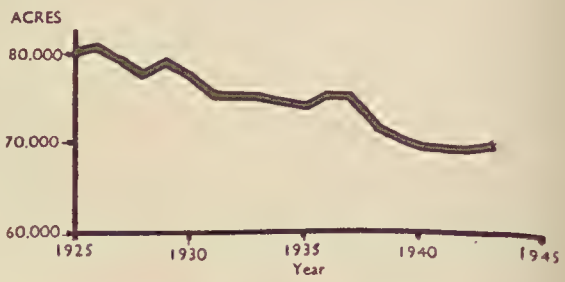
EACH year orchardists are obliged to furnish the Government Statist a return of the quantity of fruit produced by them and, in addition, every three years, a return of the number of trees and plants grown. This information is consolidated and is available to interested persons. Nevertheless, it is surprising how few people closely connected with the industry have a clear picture of the area, production and number of growers in the industry as a whole and its various branches. In this and succeeding issues, brief notes based on the Government Statist's annual returns will be published for the information of interested growers.

In Victoria, about 70,000 acres of land are devoted to orchards, representing a production of approximately 6,500,000 bushels and 6,000 growers. There are 42,500 acres of vineyards, representing a production of 9,250,000 bushels of fresh fruit and 2,400 growers. Next to dried vine fruits, the most important sections of the fruit industry are apples (24,000 acres), peaches (14,500), pears (13,000), and citrus (6,000).

During the past 20 years there has been an overall reduction in the area of orchards from 80,000 to 70,000 acres and a reduction in the number of growers by 1,700. These trends are revealed graphically in the accompanying diagrams. This reduction has occurred mainly in the apple industry, many small and unprofitable areas in marginal areas having been eliminated. On the other hand, pears and peaches have increased in importance over the last 10 years. Most other sections of the industry have remained relatively stable for many years so that it seems unreasonable to expect any spectacular expansion of fruit-growing in the post-war years unless overseas markets expand in the case of exportable fruits or the population of Australia undergoes a marked increase.




Showing reduction in the number of growers of tree and small fruits since 1925.




Decline in the area of tree and small fruits since 1925 is indicated in the graph.

The dried vine fruits industry, which depends on the operation of British Imperial Preference, has been stabilized for many years. The small percentage (4 per cent.) of unproductive vines (not yet in bearing) reflects the policy of discouraging expansion in this industry. On the other hand, in spite of overall reduction in acreage, nearly one fifth of the orchard areas consist of young trees, due to the growers' policy of changing over to more profitable varieties and kinds of fruit and replacing old trees.

Victoria produces nearly one-third of Australia's fruit. Nearly two-thirds of Australia's dried vine fruit production, which now exceeds 90,000 tons, comes from this State and three-quarters of the canned fruit production, which in pre-war years exceeded 40,000,000 cans, is also of Victorian origin.

[T. H. Kneen, B.Agr.Sc., Senior Horticultural Instructor.]

### *Protection of Trees Against Rabbits and Hares*

One of the features of the present dry season has been the shortage of food for rabbits and hares which has resulted in these rodents invading orchard areas and attacking fruit trees. In normal seasons, newly-planted trees may be attacked, but damage to mature trees is rare.

This year, however, reports have been received that mature trees have been almost ringbarked by rabbits and hares.

All orchard blocks should be netted against rabbits where there is a large rabbit population. In the more closely-settled fruit-growing areas there is not the same need for this protection, but any new areas being planted should be netted because of the serious damage which may result to young trees as a result of attacks by rabbits or hares. Unfortunately, there is at at the present time a complete absence of galvanized netting and a shortage of black iron netting, which will mean that some other means must be adopted to protect the trees.

The safest method is to provide wrappers for each tree. The best wrappers are made from pieces of inch-mesh netting formed in a cylinder around the trees, if any of this material is on hand. Spreaders should be used in the form of a couple of stakes to hold the wire out from the tree.

Suitable materials for wrapping directly around the trees include strips of hessian or old bag, several thicknesses of newspaper, or bundles of some plant material such as straw, rushes or cornstalks. All these are effective but suffer from the disadvantage that they must be removed each spring, otherwise the ties may cut into the bark of the tree.

*Repellents.*—Various mixtures plastered on fruit trees have been used to repel rabbits and hares. When feed is very scarce these do not afford complete protection.

Some of the mixtures worth a trial are as follow:—

(*a*) 1 oz. bitter aloes; 1 lb. common soap; 1 gallon water.

(*b*) Equal parts slaked lime and cow manure.

(*c*) An American formula using linseed oil and sulphur is claimed to give good results. Linseed oil is in very short supply but the method of preparation is given for future reference. Heat one gallon of linseed oil to 470°F., at which temperature a bluish vapour is given off. This should be done outside where there is no risk of fire. Remove the oil from the fire and take 12 oz. of powdered sulphur, stirring a teaspoonful at a time into the oil. Care should be exercised here as a foaming of the oil occurs. This results in a black, evil-smelling liquid which may be painted on the trunks of trees.

[G. W. Gayford, B.Agr.Sc., Horticultural Instructor.]

# THE FLOWER GARDEN

By J. L. Provan, B.Agr.Sc., Principal, School of Horticulture, Burnley Gardens

## *Variegated Shrubs*

THE use of variegated shrubs in a shrubbery has a brightening effect. Most of the variegated shrubs are evergreen and with their variegation of gold or white and sometimes pink colouring, form a permanent brightening effect. They may be grown more or less in their natural form, or can be pruned or cut to a desirable shape to give the effect required. Some of these variegated shrubs can be kept quite low in height and are useful for small foreground subjects and also as low hedges.

Some variegated shrubs show a tendency to revert to the green form, and any branches which show this reversion should be completely removed at the point where they arise from the variegated limbs. This can be done at any season of the year.

### The Privets.

The privets, well-known as hedge plants, have some good variegated forms. The common Privet or green form *Ligustrum vulgare*, is a native of Europe. It is very hardy and frequently used as a hedge. Of the variegated forms of privet, *Ligustrum japonicum tricolor* with its striking colours of gold and green, edged with pink, is perhaps the most decorative. The young growth of this shrub is very bright and gives it almost the value of a flowering shrub in the colour scheme of a garden. The Golden Privet, *Ligustrum ovalifolium aureum elegantissimum* is used largely as a hedge, but can also be used as a specimen shrub. Best results are obtained from this plant when it is constantly clipped, because the young foliage is more golden than the older foliage.

A fine specimen of the variegated pittosporum, *Pittosporum eugenioides variegata*, in a Melbourne suburban garden.

Another privet with small leaves of silver and pale green, *Ligustrum sinense argenteum variegatum*, grows to a height of 5 to 6 feet. *Ligustrum lucidum aureo-marginatum* is another handsome variety which grows a little taller, and the foliage is marked with a broad margin of gold. This shrub is a rapid grower and quickly makes a bright splash of colour in an otherwise green border.

### The Coprosmas.

Of the coprosmas the one commonly grown is the green form, *Coprosma Baueri*. This New Zealand shrub is useful for planting near the seaside, because it resists injury from the salt-laden air. Its shiny green leaves are responsible for its common name, "Venus' Looking Glass." Two variegated forms of this plant are *Coprosma Baueri picturata*, which has glossy foliage with a central yellow blotch, and *Coprosma Baueri variegata*, which has a creamy-white margin around the glossy green leaf.

### Japonica.

A hardy shrub which has withstood extreme drought this season and is suitable for planting in gardens where water supply is scarce is *Elaeagnus japonica variegata*. This shrub grows to a height of 4 to 5 feet, and has a tough leathery, variegated foliage.

### Pittosporum.

Of our native flora some of the variegated pittosporums make a pleasant feature in the garden. *Pittosporum crassifolium variegatum* has a pale greyish-green and white foliage with an upright and rather dense habit of growth, and is one of our most beautiful variegated shrubs. Another pittosporum somewhat similar to this variety is *Pittosporum eugenioides variegata* which also has a silvery-white margin around the pale-green leaf.

## THE VEGETABLE GARDEN

### Lettuce

The only variety of lettuce which can be transplanted at this time of the year is *Imperial 615*. The young plants should be set out in well-prepared soil in beds raised above the paths to ensure good drainage. Prior to planting, dig in decomposed manure or compost, and add blood and bone fertilizer at the rate of 2 oz. to the square yard. Space the plants 12 inches apart in rows 12 inches apart.

### Onions

*Victorian Brown*, *Brown Spanish*, and *White Imperial Spanish*, may be transplanted this month, or for a later crop the seed may be sown in drills in the beds where they are to remain. If transplanted, space the plants 3 to 4 inches apart with the rows about 10 inches apart. If the seed is drilled, cover with about ½ inch of fine sandy soil which is fairly free from weed seeds. It is not advisable to have weed competition with the young onion plants, and it is tedious work weeding the drilled rows. Plants should be thinned out when they are about 4 inches high.

### Leeks

Seed of *Musselburgh* and *London Flag* leeks can be sown now, covering to a depth of about ½ an inch. Plants of these varieties may also be transplanted, spacing them 5 to 6 inches apart in rows which are 18 to 20 inches apart. The usual practice is to transplant into a trench and then, as the plant grows, to draw the soil into the trench and so blanch the stems.

[*Continued on page 320*

value as a means of increasing production. The erection of structures in or at the heads of gullies, has a value where proper treatment of the catchments cannot prevent the flow of water into such gullies. Trees, such as willows, poplars, and elms, are of proved value in gullies and along streams. There would also appear to be a place, economically justifiable, for planting trees on areas that are particularly susceptible to erosion by reason of their soil type and topography. Such areas usually comprise only a very small proportion of a property, and the value of a reasonable area of timber is readily admitted by most property owners. Advice regarding the selection and planting of trees is available from the Forests Commission.

While attention to particular areas is important, and, indeed, is essential if damage already done is to be checked, the major consideration is the prevention of erosion over a property as a whole, which reduces itself to general farming and grazing management.

In regard to the management of "cultivation" lands, it is pointed out that much greater use might be made of the practice of "clover-ley" farming. Results of field experiments at the Rutherglen State Farm indicate that, by interposing a period under subterranean clover pasture between cereal crops, the land may be retained in a fertile and erosion-resistant state, while the total stock and cereal production is increased and the amount of cultivation necessary to produce crops is decreased. The practice is successfully applied by Mr. Sutherland in growing oats for grazing and hay on "clover" paddocks. It appears likely that the general application of the practice to the cultivation lands of the catchment would mean a big step forward in both erosion control and total production. Landholders who are interested in cultivation are advised to read the report on the Rutherglen work, "Maintenance of Soil Fertility and Production," by R. H. Hayman, B.Agr.Sc., This is available free of charge on application to the Director, Department of Agriculture, Melbourne, C.2. In regard to the management of grazing lands, which comprise the greater part of the area entered in the competition, three points particularly impressed themselves on the judges.

*The first is that rabbit control is the primary essential to soil conservation in the country under review.* All the leading entries in the competition had almost complete control of rabbits. As mentioned earlier, "Flowerdale," in view of the natural difficulties of the area, is outstanding in this respect. Some remarkable figures are given by Messrs. Tehan Bros. regarding differences in carrying capacity as a result of destruction of rabbits; one hill paddock of four hundred acres formerly carried one hundred dry sheep and can now comfortably carry three hundred and fifty dry sheep. From this paddock, three thousand five hundred rabbits were removed in the first digging-out. Allowing seven rabbits as equal in grazing value to one sheep, the total stocking of the paddock was formerly equivalent to six hundred sheep. Paradoxical as it seems, the paddock, now carrying three and a half times as many sheep as formerly, is yet much more lightly stocked.

Messrs. J. S. and G. S. Wall, tackle a "tunnelled" area. The tunnels were ploughed in and the area was then contour furrowed.

*The next significant aspect is the combination of cattle and sheep grazing practised by most of the entrants in the competition.* It is most noticeable that where appreciable numbers of cattle are carried, the condition of the pastures is much better from the soil conservation point of view. That is to say there is a better proportion of grass to clover, with, at the time of inspection, a sufficiency of dry feed to protect the surface of the soil. The ratio of cattle to sheep on the properties where cattle are regularly carried, varies from one to eight in the case of the average carried at "Seven Creeks" to as low as one to thirty-six. The winning property, "Seaton Vale," carries a ratio of one to ten, and it would appear that a ratio of about this order enables the economic use of pastures by

The gully in the foreground is along the former site of a plough headland. Note "fingers" extending along old "finishes", and the bare patches denoting sheet erosion.

the stock, together with the maintenance of a satisfactory grass-clover relationship in the pasture, and consequent better protection of the soil. The importance of the type and intensity of stocking in determining the type of pasture developed, cannot be over-emphasized and is well exemplified in the properties under review. Some years ago Mr. Sutherland decided that his pastures were becoming too clover-dominant, and embarked on the policy of rearing and fattening cattle in combination with the raising of fat lambs, in order to develop a pasture which he considered would provide a better balanced ration for his stock, and so maintain them in better health. The result has been entirely satisfactory in that this desired grass-clover relationship has been achieved, a high carrying capacity has been maintained, and protection has been afforded to the soil.

*The third point is the possibility that is so apparent of the development of the pastures to a much higher carrying capacity than is usual in the catchment area*, provided that due attention is paid to items one and two and that rational stocking is practised. It would appear from observations on the properties judged and through the district in general, that attempts at pasture improvement, mainly by means of top-dressing with superphosphate, have sometimes in the past meant further soil exploitation. In these cases an endeavour to obtain the maximum immediate return from the increased growth that has followed top-dressing, has resulted in a policy of constantly stocking as heavily as possible, often with sheep only. This produces clover dominance, and if the pasture is heavily stocked during the summer, little protection remains for the soil at a critical period, and it becomes vulnerable to erosion by wind and water. Where the landholder carries cattle and sheep and has been satisfied at times to allow a certain apparent waste of dry feed, the result from top-dressing has been that, over a term, the average carrying capacity has been maintained at a high rate, a good type of mixed pasture has developed, and adequate soil protection has been given. It is noteworthy that the leading properties in the competition, although still carrying sufficient dry feed to afford soil protection, were well "stocked up" and had had little recourse to hand feeding.

Taking cattle into account, the leading properties, at the date of inspection, were carrying the equivalent of 1·9 sheep per acre at "Seaton Vale" and 1·3 at "Seven Creeks"—this at the end of possibly the worst season the districts have known and after in each case fattening numbers of cattle, sheep, and lambs. For both properties authentic figures show a profitable increase in carrying capacity and returns per acre as a result largely of pasture development by the use of superphosphate and subterranean clover. From the point of view of soil conservation, the essential thing is to distinguish between development and exploitation. That is, the carrying capacity of a property should not be determined by the quantity of feed available to stock, but rather by the amount that must be left unconsumed to act as a cover to safeguard the soil. It would appear that so long as we can imitate the natural process of soil development by allowing a residue of growth to remain to decay each season—and this can be done economically by carrying sheep and cattle in reasonable numbers and proportions—then a policy of soil development by means of pasture improvement based on the use of superphosphate and the stimulation of the growth of clovers, can be embarked on throughout the area under review, with assurance that it can be undertaken with profit to the individual and safety to the soil.

### *Recommendations for Pasture Improvement*

In view of the prevalence of erosion on the unimproved grass-lands of the Upper and Lower Goulburn catchment areas, and of the desirability of pasture improvement indicated in the foregoing comments, some notes on pasture improvement are thought desirable.

In the Goulburn catchment area, in common with other parts of Victoria, the two most important deficiencies of plant food in soils carrying native pasturage are phosphorus and nitrogen, and the most effective means of supplementing these deficiencies is by the introduction of leguminous pasture plants coupled with top-dressing with superphosphate. The application of superphosphate to the soil encourages the growth of herbage, and particularly of leguminous plants, which are able to obtain nitrogen from the air. Thus are phosphorus and nitrogen both added to the soil. After a few years of top-dressing marked changes occur in the character of the soil. Due to the incorporation of the humus built up by the clover and the livestock, the surface layers become darker and more absorptive of water, and the crumb structure of the soil changes for the better. This improvement in soil fertility and physical characteristics is a very important aspect of soil conservation.

The leguminous plant that gives the best results on most of the pasture country in the area under discussion is subterranean clover, although other annual clovers such as knotted, cluster, suckling, hop, and the like make an important contribution. Subterranean clover has been widely introduced throughout the catchment area and usually flourishes where top-dressing is practised. Where not already established, it is readily introduced by sowing the seed, either with a crop, on stubble land, or by scattering over grazing land.

Along with the vigorous growth of "sub." clover that usually follows the use of superphosphate, other changes occur in the herbage grown. Native perennial grasses that ordinarily are fresh and attractive after every summer storm and are therefore kept closely grazed, are replaced by introduced annual grasses such as silver grass, brome grass, and barley grass, all of which die off in the spring and leave behind a cover of unpalatable fibrous material. By regulating the type of grazing imposed on the pasture, the development of these annual grasses can be encouraged or discouraged, and this is where the grazier must exercise skill in managing improved pasturage to produce the type of pasture that gives a good nutritive balance, and at the same time provides sufficient dry grass cover for the summer and autumn. The most important factor in grazing management is undoubtedly the number of stock carried, but such things as the closeness of grazing, period allowed for recovery between grazings, and the time of the year when grazing is withheld, also have a profound influence on the botanical composition of the pasture.

It is apparent that, if the grazier is to exercise control along these lines, he must first of all control the rabbit. Well planned subdivision of properties, with an adequate water supply, is important, while a store of conserved fodder is essential, not only as an insurance against drought, but as a means of evening up the irregular seasonal growth.

A good mixed pasture is an insurance against erosion.

The effect of intensity of grazing is evident if pastures which have been carrying sheep or cattle respectively are compared. Where sheep are the grazing animals and the rate of stocking is heavy, the pasture becomes dominated by clover, whereas with cattle and a more lenient type of grazing, grass predominates. It is the combination of sheep and cattle that most easily permits the development of a satisfactory type of mixed pasture.

Although the encouragement of a pasture consisting of subterranean clover and annual grasses represents a considerable improvement over the native unimproved grassland, the replacement of the annual grasses by a vigorous perennial grass is a further step forward. The perennial grass that appears most generally suitable to conditions in the Goulburn catchment area is *Phalaris tuberosa*, although perennial rye grass can be grown satisfactorily on favoured soils in the valleys. Once established, "phalaris" not only has the advantage of being a quick starter in the autumn, but has a longer growing season than the annual grasses, is resistant to grass grub, and withstands prolonged dryness.

Where perennial rye grass grows vigorously and persists, conditions are generally suitable for the "mid-season" and sometimes the "late" strains of subterranean clover, and occasionally for white clover. In some of the wetter places, strawberry clover grows luxuriantly and provides excellent pasturage. Vigorous stands of lucerne can be developed on well drained sites on the good soils.

On the rising country that is suitable for "phalaris", the "Bacchus Marsh" strain of subterranean clover could appropriately be introduced to ensure the regeneration of clover, as dry conditions during autumn and spring are not uncommon. In the drier western part of the area under review, the "Bacchus Marsh" and "Dwalganup" strains of subterranean clover would be more certain to persist than the mid-season "Mt. Barker" type.

The ultimate objective of pasture improvement is the provision, over the longest possible seasonal period, of the maximum quantity of the most palatable and nutritious stock fodder than can be grown under the particular conditions of soil and climate. This is best provided by a mixed pasture of legumes and grasses, of perennial types wherever possible. The pasture growth will serve to protect and build up the soil if managed correctly. Pasture improvement and soil conservation go hand in hand in the achievement of permanent maximum production.

## GARDEN NOTES—*continued from page 316.*

### *Asparagus*

Asparagus is one of the perennial vegetables and as it is usual for the bed once it is established to remain for 10 or 12 years, good preparation is essential. The bed should be trenched to a depth of 18 inches and plenty of organic matter added to the soil, together with wood ashes at the rate of 4 oz. to the square yard. A sprinkling of superphosphate over the organic matter at the rate of 1 oz. to the square yard will also be found beneficial.

The variety most commonly planted is *Connover's Colossal,* an old and well-known variety which produces good large "tips." One- or two-year-old seedling crowns are usually transplanted at a depth of about 6 inches. The small crowns should have several strong buds and the fleshy storage roots should be plump. If the roots are withered, they should be placed in water overnight. Any broken or crushed roots should be cut away. Plant in rows 18 inches apart with 18 inches between the plants. Cover the crowns with good loamy soil to a depth of 6 inches and firm by trampling the soil down. Before finally filling in the last few inches of soil a good practice is to add a layer of well-decayed manure or compost.

During the first year no tips should be cut. All the green fern-like shoots are needed to build up strong plants. In the second year the tips may be cut sparingly for a short period of say from four to five weeks, after which the leaves should be allowed to develop to further strengthen the plants.

Market-garden manure can be applied to the surface of the bed and forked in each August. Use this fertilizer at the rate of 3 oz. to the square yard.

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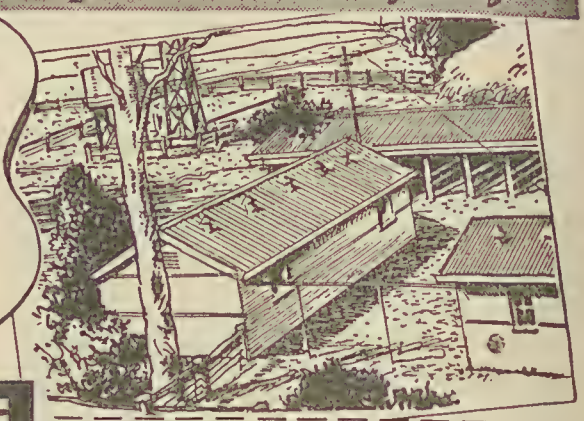

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# GRADING LAND FOR IRRIGATION

By L. C. BARTELS, B.Agr.Sc., Senior Agrostologist

In the new irrigation areas of Victoria, farmers should not compromise on the matter of grading their land and checkbanking properly, and farmers in the older irrigation districts, wedded to the bad old ways of early days, may accept the assurance that proper layout of land for irrigation will ensure better crops, more efficient use of water, reduce labour and avert the unfortunate consequences of careless irrigation.

IRRIGATION by flooding is the method commonly adopted in Victoria to water crops and pastures, and underlying good irrigation practice is the need for proper layout of distributary channels and grading and check-banking the land to permit efficient distribution of water. To secure uniform growth, water must be applied uniformly, and so the direction and volume of the flow must be regulated. It is important too, to avoid waste by percolation or by unnecessary overflow.

There has been an evolution in irrigation practices in this State. What is called the border system of irrigation is in almost general use, and happily the crude methods of wild flooding, which characterized earlier practices and still survive in places, are giving place to irrigation by the border method, which can be modified to suit most conditions.

Layout for the border system of irrigation involves the division of the land into bays or compartments by small levee banks which run down the slope—the land between the banks is levelled from side to side, and as far as possible the land along the length of the bay is reduced to a plane surface with a uniform slope. To facilitate the passage of implements it is desirable to have the banks parallel, but it should be borne in mind that straight banks and parallel banks are not an essential feature of the system.

The dimensions of the bays may be varied to meet altered conditions, but they are governed by such considerations as the slope and porosity of the soil, and the amount of sidefall of the land. The position and course of lateral water channels are necessarily important factors.

To conform to good standards, the bays may vary in length from 2 chains to 15 chains, and be from ⅓ chain to 1 chain in width. In porous soils short bays are desirable, otherwise there is risk of excessive absorption in the upper part of the bay while water is travelling over it to the ends. Likewise, when the land has flat grades, the bays should be shortened to avoid too much water lodging on the soil surface after irrigation. When sidefall is great, the banks should be erected closer together, because this will permit the transverse levelling of the bay to be done with the shifting of less earth, and the borders or check banks may be kept reasonably small.

On the clay loam soils of the Goulburn Valley and Werribee districts, suitable dimensions for irrigation bays, fitting most conditions, are 10 chains long and ½ chain wide. When settled, suitable banks may be about 4 feet wide and 6 or 7 inches high. When newly constructed they may be 9 or 12 inches high.

Under the border method of irrigation, water is admitted from a lateral channel at the head

The first requirement—a surface survey.

The buckscraper does good preliminary work in filling in the bigger depressions and in transporting large quantities of earth long distances.

of the bay. It spreads across and travels in a sheet down the bay. When the water reaches a certain point towards the end, depending on the soil and the volume and rate of flow of the water, it is cut off at the inlet to the bay. If the judgment of the irrigator is good, the spread is completed along the whole length with a minimum of waste. Because that judgment may be faulty or heavy rain may fall just after an irrigation, provision for drainage is necessary. Excess water then may be taken away to drainage channels or led to lateral distributary channels to be used lower down the field.

It should be noted that cross checkbanks are not recommended. Although it was common in the early stages of irrigation to erect cross banks to ensure the lateral spread of water, so dividing the land to be irrigated into rectangular compartments, such cross banks are objectionable. Besides necessitating the gathering of extra surface soil in their construction, they generally lead to ponding of the water, and crops such as lucerne are very sensitive to excess wetness. It is a fact that in some districts in Victoria this cross check system of grading aggravated the troubles arising from too great an absorption of water. Under the border system, the spread of water is achieved by levelling the bays across, and when crops are growing they too help to spread the water.

Much of the land under irrigation in Victoria was originally timbered, and generally the most uniform land has minor irregularities arising from the removal of trees or through crab-hole formation. Ordinarily, however, the repeated cultural operations involved in cereal growing have smoothed out most of the unevenness. Where newly cleared land is to be brought under irrigation, extended preparation is desirable.

The farmer may know the prevailing direction of slope, but he cannot rely on his judgment, and it is advisable to have the land surveyed

A land-grader in operation.

Marking the site of the checkbanks.

and a contour plan prepared. In Victoria, the engineers of the State Rivers and Water Supply Commission are very helpful in this matter, and will make a chess board survey and prepare a contour plan for a very low charge. They will guide the farmer as to the best layout for channels, banks, and drains.

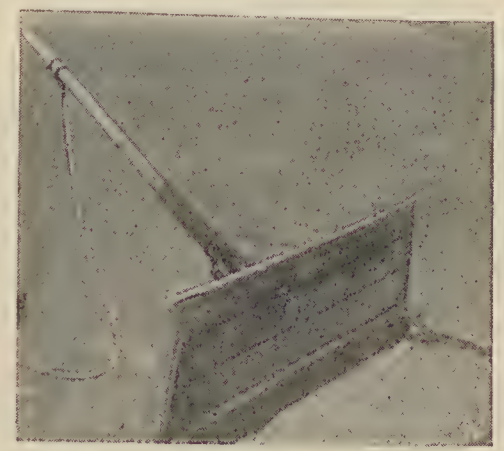
If the farmer can plan far enough ahead, he may, with advantage, do a preliminary grading in one year, sow a preparatory crop and later complete the work. Although an apparently good job is done in erasing the knolls and filling the depressions, by the first operation, these irregularities may reappear when the earth consolidates. In preparation for grading, the soil on the land to be graded should be brought to a good tilth so that it will move freely under the grading implements.

A word should be said about the construction of the channels. As time goes on, the maintenance of channels in clean condition may entail a lot of laborious work because of the growth of weeds and such plants as paspalum, which obstruct the flow of the water. These grow because the channel does not drain out properly—this will follow if the channel is cut into the ground. It is recommended that, if practicable, the level of the channel should be raised. This involves the gathering of some earth along the line of the channel as a preliminary operation. This is quite desirable except in those cases where the soils are loose or self mulching and "melt" rather easily.

Various implements are available to the farmer for land grading and making checkbanks. They range from the simple buckboard to the elaborate road grader, but there are several makes of land graders which do excellent work and are available at moderate cost.

The buckboard or grading board is a very simple device and may be constructed cheaply by any blacksmith or handy man. It is made from 2-in. hardwood and usually is about 8 feet long and 18 to 20 inches wide—thus two 9-in. boards or three 6-in. boards may be used. They are cleated together, preferably by bands of iron. Two of the cleats will be about a foot from each end. On one edge of one face of this board a strip of ¼-in. iron about 3 inches wide is bolted on—this may now be considered as the bottom front edge of the board.

On the back of the board, near the top, a wooden handle, made of 3 in. x 3 in. hardwood or 2-in. pipe, is affixed at an angle, and secured in position by three iron stays. A short rope is affixed to the end of the handle. Through the two cleats mentioned previously, holes are bored at about 6 inches, 7 inches, and 8 inches from the bottom edge, and eye bolts are put



A simple implement—the buckboard.

Showing successive operations of a buckboard in forming a bank.

through one of these on each side. The pull of the implement is made on these eye bolts, and the three holes permit the operator to move the eye bolts to secure a balance between the pull of the horses and the pressure which may be put on the handle. The bottom edge of the board acts as a fulcrum.

When the horses are pulling the board and it rides on its face, the handle is pointed forwards but the attached rope trails behind. When the rope is pulled, the board is brought into an upright position, and as soon as the top edge comes behind a vertical position the bottom presents a cutting edge to the surface and the traction causes it to gather earth which is pushed in front of the board. If the pressure on the handle is eased, the board will assume an upright position and the earth may be transported over considerable distances. When the pull on the handle or rope is further eased and the top edge of the board goes further forward, the earth in front of the board begins to slip beneath. A sudden loosening of the pull causes the earth to be dumped. Some boards are fitted with iron bows in front near the end, and these permit easy handling. An experienced operator will do excellent work with a buckboard.

If it is decided to make the bays ½ chain wide, the site of the banks may be marked by a plough furrow, and then material for them will be gathered from the surface between. The objective is to make the bays as nearly level across as possible, so the earth should be gathered mainly from the higher side. The accompanying illustrations show successive stages in the construction of checkbanks.

To shape the banks, a simple implement constructed of 2-in. hardwood and made up into two sides like so \/ may be used. The length of this V crowder, as it is called, may be 6 to 10 feet long, the height 9 to 12 inches. Standing on edge the boards are fixed at 4 or 5 feet apart in front and about 2 feet apart at the back. The implement is drawn from hooks at the wide end, and, as it is pulled along the line of the checkbank where the dumps of soil have been dropped, it gathers the soil and brings it together and leaves a neatly-shaped bank behind.

Mention must be made of another implement, the buck scraper, which is simply a big scoop, usually made of iron. This implement has a

Earth is gathered transversely and dumped at the furrow marking the site of the checkbank.

handle fixed at an angle to the centre of the back and the floor. It rides on two skids which raise the back of the scoop some two or three inches but taper off to the front so that when at rest the front edge of the scoop is inclined into the earth but the back edge of the skid is a "heel", which acts as a fulcrum when pressure is put on the handle. The pull is from both ends of the back.

When pulled along, the scoop gathers earth. With slight pressure on the handle, the front edge lifts and the scoop rides on the skids and the earth may be carried in big quantities over long distances. A sudden lift on the handle causes the front edge of the scoop to dig into the earth and the pull causes the scoop to capsize, dropping its contents. A rope on the handle enables the operator to pull it back into position when required. This is a useful implement when much shifting of earth is necessary. It can even be used to do the work of the buckboard.

A home-made "crowder."

"Crowding" checkbanks with a modern land-grader.

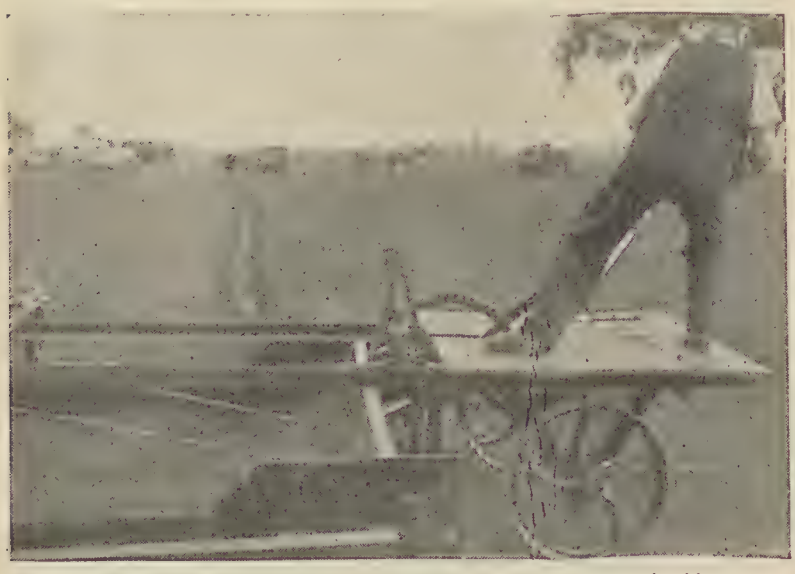
As stated previously, good work in grading and checkbanking may be done with the implements described above, and because they

A "crowder" shaping a checkbank.

are relatively cheap, they are used generally. Their efficiency, however, depends largely on the skill of the operator. The more elaborate land graders, which are essentially on a rectangular frame of big dimensions, have, to a certain extent, an automatic action.

The moveable grading board which may be across the frame is manipulated by levers on quadrants adjusted to make the work easy. In some, the grading board is affixed diagonally, and the earth, as it is gathered, is delivered at the side in a neat bank. This accumulates with each successive stroke of the implement until a bank of the required size is laid in the place desired. If the land has sidefall, this operation may be used to correct it, and the soil should be gathered from the higher side of the bay, to make the bay level across. A little thought will show why the transverse operation of a grader is likely to ensure a more effective job.

On these bigger graders, the operator rides above the dust which the grader stirs up, but the main advantage which one must assign to them is that their action is automatic. Because they have length from front to back they bestraddle the bumps and bridge the hollows, and so in their passage over the land they scrape knolls and drop earth in the depressions. A carpenter may smooth a board with a small plane ; to make it level he uses a long one.



Earth gathered across the bay is dropped on the site of the checkback.

Of course, a farmer on a small block may find a big grader beyond his means. Its use entails possession of a large team of horses or a tractor. He can compromise in the matter by using a louvre type of grader in conjunction

with a buckboard, but where extensive areas are to be graded a modern land grader is to be recommended.

In the construction of lateral channels and drainage ditches, a most useful accessory is a delver. This is another simple implement, the making of which is within the capacity of a handy man. An accompanying illustration shows its design and use. Consider two pieces of hardwood timber 9 in. x 3 in.—one 12 feet long, the other 9 feet long. The longer one is extended by plate iron to a sharp edge in front. Near this front the shorter board is affixed by a hinged joint. The boards are open to form a V, and the opening of this V may be varied and fixed by a cross rack made of two overlapping iron plates with bolt holes. You have in this the essentials of a delver. It is drawn from a link above the front end, and when pulled in the furrow of ploughed land it pushes the loose earth of the sod to the side. The erection of "delver banks" is a crude method of checkbanking, permissible perhaps in emergencies, but not to be recommended.

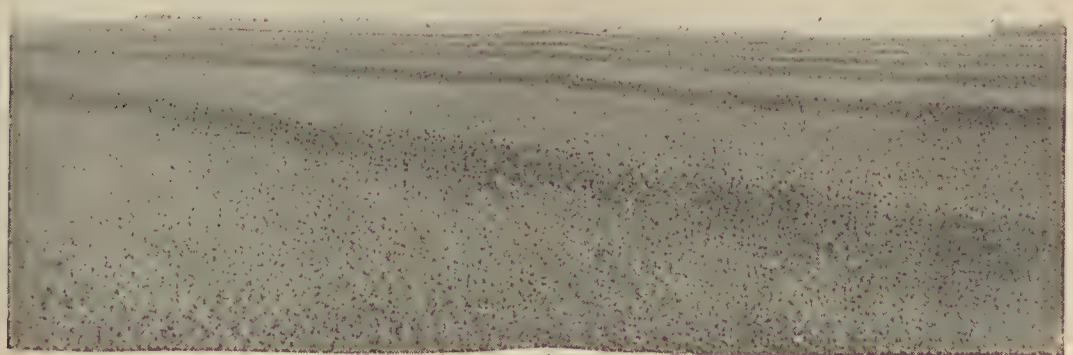
It must be emphasized that irrigation water is a utility which can be misused to the detriment of the land and the owner. That has been illustrated in many Victorian districts. The increased growth which resulted from early irrigation obscured any damage, but it has become obvious now that sustained benefits from irrigation depend on very careful application of water.

More harm will arise from excess water than from insufficient water. In the case of lucerne, for example, it has been established that 2 feet of water, in addition to normal rainfall, gives the best results in our irrigation areas. It will respond to heavier irrigation, but not in proportion to the extra water added, and the quality of the produce is affected by too heavy watering, which induces coarse growth. The lucerne plants will not live as long under heavy watering as they will under moderate watering—in fact lucerne is most tenacious under light watering.

Mixed pastures will withstand heavy watering but they, too, have optimum requirements and their tolerance to wetness is not a warrant for careless and wasteful watering.

Illustrating the work of a delver.

In view of the fact that extensions in irrigation will be limited by available supplies, and that the permanence of existing systems will depend on careful use of water, a duty devolves upon every irrigation farmer to apply water carefully, and land grading is a basic requirement to that end.



The completed job—land laid out on the border system

# FERTILIZERS FOR FRUIT

## RATIONS AVAILABLE

FRUITGROWERS may now receive their quota of nitrogenous fertilizer for 1945–46 season. Nitrate of soda is the only nitrogenous fertilizer available for fruit, with the exception of certain priority types for which limited quantities of sulphate of ammonia can be supplied.

In recent years, sulphate of ammonia, which was in very short supply, was issued solely for vegetables, potatoes, and irrigated citrus. This season the quota of sulphate of ammonia allocated to Victoria has been increased to enable a ration to be provided for dried vines and canning or dried tree-fruits grown in the northern irrigation areas.

The standard ration available for fruitgrowers in the Southern and North-eastern districts is 3 cwt. per acre of nitrate of soda and for citrus up to 6 cwt. per acre. Growers in those districts may procure their nitrate of soda (same quantity as last season) direct from their usual supplier—a further application form is not required.

The rations available for the respective types of fruit grown in the northern irrigation areas are as follows:—

For citrus:—sulphate of ammonia 4 cwt. per acre and nitrate of soda 3 cwt. per acre.

For dried vines:—sulphate of ammonia 1½ cwt. per acre and nitrate of soda 1 cwt. per acre.

For canning or dried tree fruits:—sulphate of ammonia 1 cwt. per acre and nitrate of soda 2 cwt. per acre.

For all other fruit:—nitrate of soda 3 cwt. per acre.

Fruitgrowers in the northern areas must apply for their requirements for canning or dried tree fruit and all other varieties (except citrus and dried vines) on the special application form provided for the purpose. These forms will be available from the fertilizer distributors and from the Fertilizer Section, Department of Agriculture, 81 Collins-street, Melbourne, C.1. The application, when completed, must be referred to the local orchard supervisor or the Chairman of the District or Local War Agricultural Committee for certification, before being forwarded to the Department of Agriculture.

The rations for citrus and dried vine fruits can be procured direct from the Packing Company or agency with whom the grower is already registered for fertilizer supplies.

The price of nitrate of soda and sulphate of ammonia is £18 10s. per ton, f.o.r. Melbourne, less discount of 5s. and 6s 6d. per ton respectively for cash payment. Fruitgrowers are advised to lodge their orders immediately and take delivery of their fertilizer without delay so that it will be on hand when required.

Limited quantities of potash are available for fruit and other crops. Application for a permit for this fertilizer should be made to the Fertilizer Section, Department of Agriculture, and applicants should state the quantity of potash required, the area and type of crops to be treated and the name of their fertilizer supplier.

### *Advice on the Use of Nitrogenous Fertilizers*

Citrus growers in northern irrigation areas should make full use of the available rations of both nitrate of soda and sulphate of ammonia. However, where soils are alkaline or show any sign of salt accumulation, nitrate of soda should not be used for more than two seasons in succession.

As an allotment of sulphate of ammonia has been made for dried vine fruits, and most of the areas on which these are grown are alkaline, it is suggested that nitrate of soda should not be used, particularly if this fertilizer has been used in previous years. With expectations of a light crop in the coming season, vines will not be seriously affected by limiting the amount of nitrogenous fertilizer to 1½ cwt. per acre of sulphate of ammonia.

Canning-fruit growers will be allowed 1 cwt. per acre of sulphate of ammonia, but as this would be insufficient for the needs of the trees, and nitrate of soda is quite suitable for use in the canning-fruit areas, full use should be made of the ration of this fertilizer.

The allowance of 3 cwt. per acre of nitrate of soda is adequate to maintain the health of fruit trees in North-eastern, Harcourt, and Southern districts. This fertilizer is quite suitable for these districts, and growers should use their

[*Continued on page* 330.

# Infectious Laryngotracheitis

## Control Measures for Use in the Country

By G. NICOL, B.V.Sc., Veterinary Officer

NUMEROUS requests have reached the Department of Agriculture for supplies of vaccine to combat a disease in poultry which owners have believed to be infectious laryngotracheitis. From letters received, it would appear that some poultry owners are under the impression that the vaccine used against the disease mentioned is a curative vaccine for all ailments of poultry affecting the respiratory tract. To correct this wrong impression and to indicate lines of control in respiratory infections of poultry, the following article has been written.

Both of the birds illustrated above are affected with infectious laryngotracheitis and either may be a source of infection to the remainder of the flock. Note swollen sinus in the white fowl and slight nasal discharge in the other.

Firstly, symptoms of difficulty in breathing with the formation of cheesy deposits in the mouth and throat, and the development of swollen eyes with excessive mucous formation about the nose and throat, are not necessarily indicative of infectious laryngotracheitis. Other respiratory conditions also have these symptoms, and as the infectious laryngotracheitis vaccine issued by the Commonwealth Serum Laboratories is suitable for use against infectious laryngotracheitis only, it will be appreciated that indiscriminate issue of the vaccine would not serve a useful purpose, and, in addition, as the vaccine is a living one, its use may be attended by some risk where the disease has not been diagnosed or is complicated by some other respiratory condition.

Gasping symptoms are often associated with incomplete blockage of the windpipe opening. Removal of material from top of the windpipe will often save the bird from choking.

The difficulties of assisting poultry farmers in country districts are threefold: limited veterinary staff precludes special visits being made to distant areas for purposes of diagnosis; submission of birds to the laboratory for examination results in a certain time-lag which is inevitable before a diagnosis is established and advice can be given for the particular complaint. In the meantime the farmer is at a

loss to know what are his best means of control. The keeping qualities of infectious laryngotracheitis vaccine are limited and do not allow of its use in distant areas except under special circumstances. For example, where it is possible for an owner to bring sick birds to the Veterinary Research Institute, Parkville, and a diagnosis of the disease is made, a demonstration of the method of vaccination will be given and a release of vaccine from the Commonwealth Serum Laboratories effected. Vaccination can then be carried out immediately on the owner's return to his property, thus ensuring that the vaccine is used within its viable or safe period. Further research work is necessary to determine means of increasing the keeping qualities of this vaccine. On account of the difficulties mentioned the following outline of control has been made to assist country farmers who may encounter outbreaks of respiratory infections in their poultry:—

1. Learn to observe the birds so that early symptoms will be detected. It is useless waiting until most of the birds are affected before taking action.

2. When symptoms of some respiratory condition are noted treat this as an infectious disease and immediately isolate the affected birds.

3. Where practicable remove the surface layer of soil from pens holding affected birds, or alternatively treat with unslaked lime.

4. Bear in mind that water vessels readily become contaminated with the mucus from infected birds, and consequently the water should be changed, preferably twice daily, and the vessels thoroughly cleansed on each occasion.

5. Include a fish-oil substitute containing Vitamin A in the mash; this is important where adequate green feed is not available as Vitamin A has an important part to play in the resistance of birds to respiratory infections.

6. Where individual treatment of affected birds is attempted this should consist of removal of the material which accumulates at the top of the windpipe and is partly responsible for the gasping symptoms which often cause asphyxiation, and also expression of the material in the eye cavity and from the roof of the mouth and within the mouth itself. This should be done by means of forceps and cotton wool, and followed by a mild dressing such as 4 per cent. boric acid in water or the use of eye drops such as 10 per cent. argyrol. Dipping of the bird's head in a strong disinfectant solution is to be discouraged as this practice is likely to do more harm than good.

7. No affected birds should be returned to the main pens while there is any suggestion of swollen eyes, or mucus about the nostrils or mouth, or cheesy material in any of these sites. Birds showing any symptoms however slight are still likely to carry infection, and as such constitute a menace to the remainder of the flock.

## FERTILIZERS FOR FRUIT—*continued from page 328.*

full ration. The use of nitrate of soda is further discussed in the Orchard Notes, in this issue of the Journal.

### Rates of Application

Because of its ready availability it is better to apply nitrate of soda in a number of small doses, rather than apply the whole of the ration in a single application. Maximum application at one time should be limited to 2 cwt. per acre. If more is available it should be applied about a month later. Sulphate of ammonia may be applied at the rate of 4 cwt. per acre at one application on citrus trees.

# Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

### *Grass Hay Conservation*

NOW is the time to plan for the harvesting of all surplus pasture as hay or silage. Arrangements should be made to subdivide pasture paddocks and to close them as soon as pasture growth is sufficient in the other paddocks to carry the farm live stock. Mowers, hay-rakes, and other harvesting machinery should be thoroughly overhauled so that no time will be lost when harvesting begins.

The method of conservation also should be decided in advance. Silage for example needs a considerable amount of labour to make, but its making is not interrupted so seriously nor is the quality affected to any extent by bad weather. Loose grass hay is the least expensive fodder to conserve as far as labour is concerned, but more work is required at feeding-out time. A team of men could stack twice as much loose hay as baled hay, and this method is worth consideration when labour is scarce. If desired, loose hay can be pressed later on.

Baled hay is the most convenient to handle. The efficiency of the large and small presses is similar, as about 3½ tons of baled hay may be pressed each day for each man in the team, in both cases. In a survey made in 1941, it was shown that a large press baling 25 tons per day required three men to feed, two men to tie, one man to stack the bales, and one man to sweep hay to the press with a tractor.

With a small press driven by a 4 h.p. engine about 10½ tons per day can be baled. One man is required to sweep with a horse, one to feed, and another to tie and stack the bales. With these smaller presses the bales are usually about 10 lb. lighter and a little more wire is required per ton, but it is possible to use the old wire saved from the previous year. Usually 1 cwt. of wire is required to tie 10 tons of baled hay.

There has been a big change over from loose hay to baled hay of recent years, chiefly on the grounds of convenience in handling. Three times as much grass hay was pressed during the past three years as in the preceding three years. This required an additional 1,000 tons of baling wire.

The use of pick-up balers is a new development in grass-hay harvesting which may reduce labour requirements by nearly 50 per cent. Last season about twenty pick-up balers were in use in Victoria, and the number is likely to increase. The design of these machines is rapidly being improved. At present, however, some of the machines require considerable mechanical skill to operate efficiently.

Grass hay, with a moisture content of 25 per cent. or less, may be stacked loose or pressed into bales containing not more than 8 lb. per cubic foot without danger of spoilage, even if stored immediately. If the hay contains more than 25 per cent. of moisture it is apt to become discoloured and dusty in the stack or loosely pressed bale. It is essential that grass hay be stacked or pressed as quickly as possible. When the grass stalks can be twisted without moisture being squeezed out, the hay can be stacked or loosely pressed.

With the large presses, the bales are usually pressed tightly, and consequently the hay must be much drier. In the early morning, after a dewy night, the moisture content of cured hay in the windrow in southern Victoria is apt to be fully 25 per cent. Such hay could be stacked loose or pressed into relatively loose bales, but it would spoil if pressed into tight bales.

### *The Slaughter of Heifer Calves*

The January issue of this Journal contained an account of a survey conducted during July and September, 1944, to obtain an estimate of the number of female "bobby" calves being slaughtered for human consumption. The survey was continued, and has now been in progress for twelve months. During five periods the carcasses of almost 37,000 calves were inspected, and the complete results are set out in the following table :—

| — | Percentage of Heifer Calves Slaughtered. |
|---|---|
| | % |
| July, 1944 .. .. .. | 24 |
| September, 1944 .. .. | 25 |
| February, 1945 .. .. | 34 |
| April, 1945 .. .. .. | 31 |
| June, 1945 .. .. .. | 34 |

The total number of calves of both sexes slaughtered during 1944–45 was about 330,000. Half of these were slaughtered during July, August, September, and October, when the proportion of heifers was about 25 per cent., and the other half during the remaining eight months of the year, when the proportion of heifers was about 33 per cent., which means that between 90,000 and 100,000 heifer calves were slaughtered for human consumption during the twelve months ended 30th June, 1945.

About 400,000 heifer calves are born each year in dairy herds in Victoria, yet the total number of dairy calves in the State at the present time is only 200,000. The majority of these are heifers. This loss to the dairying industry of 200,000 female calves before they reach the age of twelve months includes the 100,000 which have been slaughtered as bobby calves, the remainder having either been sold as young cattle, destroyed (mostly as underweights) or died.

It is doubtful whether sufficient heifers were raised last year to provide for essential replacements in dairy herds, let alone to increase the dairy cow population or to improve the production of herds by adequate culling.

The recent drought must be considered as one of the factors contributing to the reduction in the number of dairy calves from 280,000 in 1943 to 200,000 in 1945. Although in Gippsland and the Western District, the principal dairying districts of the State, pasture conditions were normal during 1944, supplementary fodder reserves had become depleted because stocks were used for bush-fire relief earlier in the year and for drought relief later, while supplementary foodstuffs of all kinds have been much below requirements. Whether the drought was mainly responsible for the failure of dairy farmers to raise the usual number of herd replacements will not be certain until it can be shown that, with the return of normal seasons, there is a marked increase in the number of young dairy cattle.

Another feature of the "bobby" calf trade is the considerable loss of meat which results from the 40-lb. carcass minimum weight limit. Meat inspectors are required to reject carcasses weighing less than 40 lb., although the flesh of these is frequently more mature than that of the carcasses of much younger but larger type calves.

Many thousands of calves are destroyed on farms each year because they are underweight, and therefore not worth the cost of transport to the market. If the weight limit were reduced and maturity of flesh used as a guide to suitability for human consumption, a large proportion of the calves now destroyed on the farms could be marketed. In addition to the financial benefit to farmers, at least another 3,000 tons of carcasses would be obtained annually.

The dairying industry would benefit in another way also, because with all the calves on the farm having a slaughter value, farmers would exercise

greater care in the choice of their replacements instead of selling the biggest calves and choosing the heifers they wish to keep from amongst the underweights. Large calves are less trouble to rear than weedy ones and the proportion successfully raised is greater. Furthermore, they usually grow into the best dairy cows, and this fact has been verified at the State Research Farm, Werribee.

[J. T. Kelly, B.Agr.Sc.,
Science Field Officer.]

### *"Grass Seed" Abscesses in Cattle*

Small foreign bodies, generally grass seeds, will often penetrate into the soft tissues near the base of the tongue or along one of the salivary ducts leading to a salivary gland. This penetration is followed by abscess formation, giving rise to a set of symptoms alarming to the owner, and a rapidly developing inflammatory swelling in the region of the throat, sometimes extending towards the ears. Pain and soreness are evidenced by the refusal of the affected animals to eat owing to the difficulty of swallowing, and milk secretion in the case of affected cows becomes greatly diminished.

The rapid development in a few days of this painful swelling is in itself sufficient to distinguish the condition from an infection with either tuberculosis or actinomycosis of the throat, both of which are slowly developing painless conditions.

Treatment for a "grass-seed" abscess can be carried out by the owner, and should consist of fomenting or mildly blistering the affected part until the abscess shows signs of "pointing" or coming to a head. The abscess should then be opened, using a sharp knife or razor blade for the purpose, and taking care that the incision is sufficiently large and so situated—i.e., at the lowest point—as to ensure adequate drainage. After the extrusion of all pus, which probably will be foul-smelling, the abscess should be curetted, and, on the farm, an ordinary dessert-spoon will do for this purpose. The cavity should then be packed with gauze or cottonwool soaked in weak tincture of iodine. This packing can be left in the cavity for 24 hours. Following its removal there should be a daily syringing, using a 2 per cent. solution of lysol or dettol, or a solution of potassium permanganate (Condy's crystals). The daily douching should be continued until healing is complete.

If treatment is carried out as outlined, healing will take place with a minimum of thickened scar tissue. If, however, the abscess is allowed to run its course and burst normally, there is generally a thickened unsightly lump left at the site; but a worse feature is that drainage is seldom complete, and there is a danger of a recurrence. If the abscess should burst before it can be lanced, the opening should be enlarged and syringed out with a disinfectant.

The condition, "grass-seed" abscess, is one which, apart from the pain and some toxic effect caused by the development of the abscess, has no harmful effect on the animal.

Provided treatment is carried out at the correct time and the abscess is opened when soft and fluctuating, the operator need have no fear of injuring the animal, and the pus, although foul-smelling, will not harm the operator if the hands are carefully washed in a disinfectant solution after operating.

The condition is not one for which compensation is payable under the Cattle Compensation Act.

[A. R. Grayson, B.V.Sc.,
Veterinary Officer.]

### *Water cannot replace Milk as a Pig Food*

In a case of unthrifty pigs recently investigated it was found that in the summer the pigs were given a diet comprised almost entirely of separated milk, and as the milk supply diminished in the winter, water was added to maintain the volume of food and drink given to the pigs.

When separated milk is the sole diet, a pig 100 lb. live weight consumes about four gallons daily and grows fairly well, but if a pig of the same weight were fed dry foods, such as wheat-meal and meat-meal, it would eat about 4 lb. of these and would drink about one gallon of water daily.

The pig on the separated milk diet would be forced to drink about three gallons of liquid more than it required, because there is only about 1 lb. of dry food in each gallon of separated milk. By adding water to separated milk, the feeder gives himself extra work and makes the pigs drink unwanted water, which retards their growth. The diminishing supply of milk should be supplemented by solid foods such as crushed wheat or pollard as available, 1 lb. of either replacing each gallon of separated milk.

### *New Pig Book*

A new publication, "Pig Raising Illustrated," containing more than 70 pages and nearly 200 illustrations, has recently been issued by the Department. The book covers most aspects of

pig production in a concise manner, and with the use of photographs and drawings each point in the discussion of the breeding, feeding, and housing of pigs is illustrated.

"Pig Raising Illustrated" may be obtained from the Director, Department of Agriculture, Melbourne, at a cost of 2s. 6d., post free.

[L. A. Downey, H.D.A.,
Pig Expert.]

### *Poultry*

While the system of keeping adult laying fowls under intensive conditions is acknowledged to be the best for maximum egg production, this is not so with the operations of breeding and rearing. The greatest success in these fields, has been achieved when these operations have been conducted under more natural conditions.

Laying fowls are commonly kept for two laying seasons in houses without outside runs. Under these conditions they lay the greatest number of eggs, and also can be kept under complete control.

With the provision of concrete floors on which litter is placed, and with properly constructed perches, and other appliances, worm infestation and disease can be reduced to a minimum by cleaning out the pens regularly every three months. This work is considered to be a part of the normal routine work of a poultry farm. Some poultry farmers allow the laying birds out on small areas of land in front of the houses occasionally, and in certain cases this has improved the health of the birds, but care should be taken to have the ground turned over from time to time, and planted with vegetation, in order to minimize risk of disease.

[H. F. Clinton,
Poultry Expert.]

### *Bee-keeping*

Advantage should be taken of fine weather during August to note the interior condition of each hive.

Breeding should be well under way, and as this will cause a much heavier drain on the food supply, the amount of stores in hand should be the first consideration. The necessary minimum would vary according to local conditions and the numerical strength of the colony. If fresh honey is being stored, a safety margin to tide the colony over a possible break of cold squally weather would be from 5 to 10 lb. of sealed honey. On the other hand, if no nectar is available, a much larger reserve would be necessary to avoid feeding with sugar syrup.

Any damp or mouldy combs should be replaced with fresh ones.

With a view to early queen rearing, colonies should be selected for the purpose, and light stimulative feeding with thin sugar syrup commenced to increase breeding. Those selected for the rearing of high-class drones should be supplied with drone combs in the brood chamber. It should be remembered that the record of the colony supplying the drones is just as important as that of the colony from which the larvae will be used for the rearing of young queens.

[J. W. Thomlinson,
Apiary Inspector.]

## HERD TESTERS WANTED—Free Instruction Class

A class to enable persons, both male and female, to qualify as Herd Testers will be held at the School of Primary Agriculture, Swan-street, Burnley, from the 28th August to 13th September next. The class will be free, and successful candidates will be qualified to accept positions as herd testers with the Subsidized Herd Testing Associations.

The work of a herd tester consists of testing and keeping records of dairy herds of a particular district. Testers are not employed by the Department of Agriculture, but by the local Herd Test Association.

The wages paid vary according to the number of herds tested and other factors, but would range from £4 to £5 per week, plus meals and sleeping accommodation while testing. Particulars of the class, entries for which close on 21st August, may be obtained on application to the Superintendent of Dairying, Department of Agriculture, Melbourne, C.2.

# Werribee Feeding Tests—1944-45

By W. O. PEDERICK, Assistant Poultry Expert, and A. G. CLARK, Poultry Foreman

EXTENDING over a period of 12 months from 1st April, 1944, to 31st March, 1945, poultry feeding tests were conducted at the State Research Farm, Werribee, to compare the respective values of rations containing whole grain and meatmeal with the standard bran and pollard ration.

For the purpose 250 Australorp and 250 White Leghorn pullets, hatched in August and September, 1943, were used and divided into pens, each containing 50 birds. The birds were intensively housed in a laying shed 110 feet long by 20 feet deep, divided into ten pens, each 11 feet by 20 feet, providing a little over four square feet of floor space per bird.

The following rations were fed:—

Pens No. 1 (Australorp) and 10 (White Leghorn). No mash. Whole wheat always available in hopper. Meatmeal always available in hopper.

Pens No. 2 (Australorp) and 9 (White Leghorn). No mash. Mixed whole grain (4 parts wheat, 1 part oats, 1 part barley), always available in hopper Meatmeal always available in hopper.

Pens No. 3 (Australorp) and 8 (White Leghorn). Control—Dry mash (30 lb. bran, 60 lb. pollard, 10 lb. meatmeal), always available in hopper. Mixed whole grain (4 parts wheat, 1 part oats, 1 part barley, 1 part maize), fed in litter.

Pens No. 4 (Australorp) and 7 (White Leghorn). No mash. Whole wheat fed in litter twice per day. Meatmeal always available in hopper.

Pens No. 5 (Australorp) and 6 (White Leghorn). No mash. Mixed whole grain (4 parts wheat, 1 part oats, 1 part barley), fed in litter twice per day. Meatmeal always available in hopper.

Green feed was fed to each pen daily and shell-grit was always available.

As in previous tests the cost of food was arrived at by taking the average wholesale

Portion of the laying shed at Werribee, in which the feeding tests were conducted.

prices published in the daily press during the year. Delivery charges were not added. The eggs laid were valued at the gross wholesale hen-egg price, without deducting any marketing or grading charges. These charges would probably average approximately four-pence per dozen which, with an average production of 180 eggs, would amount to 5s. per bird per year.

### *Conclusions*

Previous tests, the results of which were published in the Journals of Agriculture for August 1943, and 1944, have shown that satisfactory egg production can be obtained by feeding a ration containing mixed whole grains and meatmeal and no mash. Owing to the fact that during recent years oats, barley, and maize have been almost unprocurable, it was decided in this year's tests to feed several pens on a ration consisting solely of wheat and meatmeal, and, for the purpose of comparison, other pens were fed on mixed grains and meatmeal, and the control pens on the standard ration consisting of a dry bran and pollard mash with mixed grains fed at night.

In the Australorps, the highest return over feed cost was given by the pen receiving wheat in the litter and meatmeal; the second highest —mixed grain in the litter and meatmeal; the third highest—wheat in the hopper and meatmeal; the fourth—mixed grain in the hopper and meatmeal; and last—the control pen.

In the White Leghorns, the highest return over feed cost was given by the pen receiving wheat in the hopper and meatmeal; the second highest—mixed grain in the hopper and meatmeal; the third—wheat in the litter and meatmeal; the fourth—mixed grain in the litter and meatmeal; and last the control pen.

It is interesting to note that, with both breeds, the highest returns were from pens receiving wheat and meatmeal, the only difference being that in the Australorps, the wheat was fed in the litter and, in the White Leghorns, the wheat was fed in a hopper. It has been noticed in previous whole-grain feeding tests that Australorps have always done better when the grain has been fed in the litter, than when fed in a hopper. With White Leghorns however, there has been practically no difference.

Although the quantity of meatmeal consumed by the birds on the whole grain ration was high—being approximately 20 per cent. of the total food consumed, the health of the birds was apparently not affected. However, in the tests now in progress, the amount of meatmeal is being rationed at the rate of one pound per day per 50 birds, which is about ten per cent. of the total food. If the smaller amount of meatmeal will give satisfactory results, the higher amount can be considered wasteful.

These tests show that either wheat or mixed grain and meatmeal will give fairly satisfactory results for egg production.

In normal times, when other grains are available, a grain mixture consisting of wheat, oats, maize, and barley, can be recommended. The variety in the ration is definitely beneficial to the birds.

The simple method of feeding whole grains and meatmeal is particularly suitable for farmers who grow their own grain. The cost of carting other foodstuffs to the farm and the saving of time and labour are very considerable.

With this system of feeding it is most important that an abundant supply of succulent green feed is fed to the birds regularly each day.

The table shows the total food consumed, cost of food, eggs laid and their value, and the return over food cost.

## Test No. 25.—Werribee Feed Tests, 1st April, 1944, to 31st March, 1945 (12 Months).

| Pen No. | Fifty Birds per Pen. | System of Feeding. | Bran. | Pollard. | Meat-meal. | Wheat. | Oats. | Barley. | Maize. | Total Food Consumed. | Cost of Food. | Eggs Laid. | Value of Eggs. | Return over Food Cost. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | £ s. d. | | £ s. d. | £ s. d. |
| 1 | Australorps .. | Wheat in hopper; meatmeal in hopper | .. | .. | 725 | 3,120 | .. | .. | .. | 3,845 | 13 1 4 | 8,668 | 67 2 10 | 54 1 6 |
| | | **Average .. ..** | .. | .. | .. | .. | .. | .. | .. | **76·9** | **0 5 3** | **173·4** | **1 6 10** | **1 1 7** |
| 2 | Australorps .. | Mixed grain in hopper; meatmeal in hopper | .. | .. | 825 | 2,277 | 569 | 569 | .. | 4,240 | 14 15 6 | 9,202 | 70 19 11 | 56 4 5 |
| | | **Average .. ..** | .. | .. | .. | .. | .. | .. | .. | **84·8** | **0 5 11** | **184·0** | **1 8 5** | **1 2 6** |
| 3 | Australorps .. | Control pen—dry mash in hopper; mixed grain in litter | 821 | 1,643 | 274 | 1,355 | 339 | 339 | 339 | 5,110 | 17 13 5 | 8,927 | 68 17 8 | 51 4 3 |
| | | **Average .. ..** | .. | .. | .. | .. | .. | .. | .. | **102·0** | **0 7 1** | **178·5** | **1 7 7** | **1 0 6** |
| 4 | Australorps .. | Wheat in litter; meatmeal in hopper | .. | .. | 945 | 3,605 | .. | .. | .. | 4,550 | 15 13 3 | 10,065 | 77 2 6 | 61 9 3 |
| | | **Average .. ..** | .. | .. | .. | .. | .. | .. | .. | **91·0** | **0 6 3** | **201·1** | **1 10 10** | **1 4 7** |
| 5 | Australorps .. | Mixed grain in litter; meatmeal in hopper | .. | .. | 825 | 2,677 | 669 | 669 | .. | 4,840 | 16 12 3 | 10,075 | 77 15 2 | 61 2 11 |
| | | **Average .. ..** | .. | .. | .. | .. | .. | .. | .. | **96·8** | **0 6 8** | **201·5** | **1 11 1** | **1 4 5** |
| 6 | White Leghorns | Mixed grain in litter; meatmeal in hopper | .. | .. | 1,000 | 2,677 | 669 | 669 | .. | 5,015 | 17 10 8 | 8,856 | 68 8 3 | 50 17 7 |
| | | **Average .. ..** | .. | .. | .. | .. | .. | .. | .. | **100·3** | **0 7 0** | **177·1** | **1 7 4** | **1 0 4** |
| 7 | White Leghorns | Wheat in litter; meatmeal in hopper | .. | .. | 925 | 3,605 | .. | .. | .. | 4,530 | 15 11 2 | 8,730 | 67 9 7 | 51 18 5 |
| | | **Average .. ..** | .. | .. | .. | .. | .. | .. | .. | **90·6** | **0 6 3** | **174·6** | **1 7 0** | **1 0 9** |
| 8 | White Leghorns | Control pen—dry mash in hopper, mixed grain in litter | 885 | 1,770 | 295 | 1,355 | 339 | 339 | 339 | 5,322 | 18 7 3 | 8,737 | 67 8 9 | 49 1 6 |
| | | **Average .. ..** | .. | .. | .. | .. | .. | .. | .. | **106·0** | **0 7 4** | **174·7** | **1 7 0** | **0 19 8** |
| 9 | White Leghorns | Mixed grain in hopper; meatmeal in hopper | .. | .. | 825 | 2,400 | 600 | 600 | .. | 4,425 | 15 6 10 | 8,891 | 68 6 11 | 53 0 1 |
| | | **Average .. ..** | .. | .. | .. | .. | .. | .. | .. | **88·5** | **0 6 2** | **177·8** | **1 7 4** | **1 1 2** |
| 10 | White Leghorns | Wheat in hopper; meatmeal in hopper | .. | .. | 755 | 3,030 | .. | .. | .. | 3,785 | 12 19 2 | 8,623 | 66 19 5 | 54 0 3 |
| | | **Average .. ..** | .. | .. | .. | .. | .. | .. | .. | **75·7** | **0 5 2** | **172·5** | **1 6 9** | **1 1 7** |
| | | Total for 500 birds .. | .. | .. | .. | .. | .. | .. | .. | 45,662 | 157 10 10 | 90,774 | 700 11 0 | 543 0 2 |
| | | **Average .. ..** | .. | .. | .. | .. | .. | .. | .. | **91·3** | **0 6 4** | **181·5** | **1 8 0** | **1 1 8** |

*Notes.*—Average gross price of eggs per doz., 1s. 10d.; food cost per dozen eggs, 5d.; food consumed per egg laid, 8 oz.; food consumed per bird per day, 4 oz.; cost of food per bird per week, 1½d.

# SAMPLES FOR ANALYSIS AND EXAMINATION

One function of the Department of Agriculture is the analysis, examination, or identification of samples of various kinds submitted by farmers. That this service is appreciated and utilized is evident from the large number of samples submitted each year. However, if the best service is to be given, it is obvious that certain precautions must be taken in selecting and forwarding the sample; if the amount of the sample is insufficient, if the sample is unmarked and cannot be identified, or if it arrives in a decomposed condition, delay and disappointment must result.

The following directions compiled from notes supplied by various branches of the Department of Agriculture and covering the range of material likely to be encountered, are given for the guidance of farmers. Strict attention to the details outlined will help the Department to help you.

## *General Directions*

BEFORE dealing with individual types of samples, there are a few general directions which are applicable to every sample, irrespective of its nature.

(*a*) Mark each sample with the sender's name and address, the description of the sample and the date taken; where more than one sample is sent in the same package, this information can be enclosed on a slip of paper, provided each sample carries an identification number.

(*b*) Send a covering letter (or telegram, with perishable material), giving complete details of each sample, full name and address of the sender, date on which samples were despatched, whether by rail or post, the reason for sending the sample and any other information which might assist the Department to furnish the most useful report.

(*c*) See that packages are adequately addressed and that full rail or postal charges have been paid.

(*d*) All containers must be clean and of such a nature that they will not contaminate the sample. They must be securely packed to prevent damage or breakage in transit. The corks of bottles containing liquid should be wired on or otherwise securely held in place, and the bottles should be surrounded by cotton wool or other absorbent material and enclosed in a strong outer container.

(*e*) Where containers have been sent out by the Department, they should be returned by the same means as were used to forward them. If containers are sent by rail, return by rail; if by post, return by post.

## *Samples for Chemical Analysis*

Send to:—

Agricultural Research Chemist,
State Laboratories,
Gisborne-street,
Melbourne, C.2.

Chemical examination of a wide variety of materials of interest to farmers is carried out at the State Laboratories. Apart from the above-mentioned general directions regarding packing and despatch, it is of the greatest importance that certain procedures should be followed strictly, in order that full benefit may be obtained from the analysis. For all classes of materials, the sample sent must be thoroughly representative of the whole bulk of material to which it is proposed to apply the results of analysis. Attention should be given to the following points dealing with specific materials:—

**Fertilizers.**—It is not sufficient to take a handful of fertilizer from the top of one bag. A composite sample from a number of bags is required, but if only one bag is available, the sample should be taken from different parts of the bag. A glass jar with a tightly fitting lid is the most suitable container, and the sample should weigh about one pound. Wherever possible, send one of the labels from the bags, or at least send the name of the fertilizer, the manufacturer and where purchased. A nominal fee of 10s. 6d. is charged farmers for an analysis of a sample of fertilizer.

**Liming Materials.**—About 2 lb. weight of sample should be sent. An airtight container is required for quicklime; other types of lime may be sent in a tin, jar or box. If the lime has been purchased, send a label from the bag

or the information as required for fertilizers. If the sample is from a deposit, take steps to see that a reasonably representative sample is taken. The nominal fee to farmers for the determination of the lime content of such a sample is 2s.

**Waters.**—A minimum of 10 oz. of water is required in the case of water for stock or irrigation; if for human consumption, send 1 quart. Use a clean bottle and rinse before filling with the water to be sampled. It is important to state the source of the water and the purposes for which it is required. A fee of 5s. per sample is charged farmers for the analysis and report.

**Pest Destroyers, Fungicides, &c.**—In view of the difficulty of taking a representative sample of this class of materials, farmers desiring to submit samples should write to the Agricultural Chemist stating the type of material involved. Advice will then be given as to the quantity of sample required, the method of sampling and the type of container to use.

**Stock Foods.**—Prepared stock foods and dry fodder may be packed in boxes, bags or tins; air-tight glass containers should be used for meat-meals or the like, or for stock-licks or for any material likely to absorb moisture in transit. About 1 lb. weight of sample is required. If purchased in bags, forward one of the labels. The nominal fee for an analysis of a stock food is 10s. 6d.

Green stuff of any kind should be packed in newspaper to reduce the risk of it becoming mouldy in transit; about 4 lb. of such material is required.

**Poison Cases.**—Specimens from animals suspected of having been poisoned should be sent as directed later under "Veterinary Specimens."

**Soils.**—With soils, it is essential to obtain a representative sample, and to do this, the following procedure should be adopted:—

With a spade, make a small clean hole reaching to the full depth of the surface soil.

Take out a perpendicular slice of soil from the surface to subsoil and place in a clean bag or box.

To obtain a fair average sample, repeat these operations at six spots at least, distributed over the area being sampled, the soil from each sampling being placed in the bag or box.

The soil so taken should then, without delay, be turned out on a clean board or flagstone and thoroughly mixed. Place about two pounds of the well-mixed sample in a clean container, on which identification marks are made, including the depth to which the soil has been sampled. Stones, except large ones, should not be removed from the sample.

When sampling, as described above, the sample should be taken from the surface to the line of change between soil and subsoil. Where the top soil is very shallow or where there is no definite change to subsoil, a depth of eight inches may be adopted. In cases of doubt with shallow soils, &c., it is preferable to take samples of each different layer or stratum of soil and leave it to the agricultural chemist to mix them.

If it is desired to submit a sample of the subsoil, a similar procedure is adopted, the subsoil sample to be taken from each hole after the top soil sample has been removed.

If the soil in different parts of the area is manifestly of different qualities, samples of each kind should be forwarded.

In forwarding samples the following information must be supplied:—(1) The depth of the samples taken; (2) where the land is situated; (3) whether the soil is from level country, swamp, alluvial land or from hill country—if from hill country the aspect should be stated; (4) if it is virgin soil, whether it is forest or open country—if forest, the kind of trees and undergrowth should be mentioned; if open country, the kind of grasses growing on it; (5) if it is in cultivation, how long it has been cultivated, what was the last crop, when and what was its last manuring, what has been the manuring and the rotation of crops in previous years, what has been the yield per acre, and what is considered a good yield in the district; (6) whether the land is drained or not; (7) what is the nature of the climate and seasons of the district, and what kind of weather prevailed for the few days previous to taking the sample; and (8) what lies below the subsoil.

In addition, it is necessary to state what special information it is desired that the analysis should furnish.

Where advice can be based on relatively simple quantitative tests, the nominal fee is 4s. per sample. A complete analysis costs 10s. 6d. Simple individual determinations (such as salt or reaction), are conducted for 2s. per sample.

**Milk and Dairy Produce.**—Milk samples (about 8 oz.), should be taken after thoroughly mixing the bulk. The bottle containing the sample should be quite clean and dry. If milk samples are to be sent from any distance, add three or four drops of formalin, and mention this addition in your covering letter. Other dairy produce should be sent in clean bottles or glass jars. Such samples from factories are sent to the School of Dairy Technology, Werribee.

### *Samples for Bacteriological Analysis*

With the exception of milk samples taken from individual cows with suspected mastitis (referred to under the heading "Veterinary Specimens") send to:—

The Principal,
School of Dairy Technology,
Werribee.

In preparing samples for bacteriological analysis there are three important essentials which must be fulfilled if the results of the analysis are to reveal information of value to the sender of the samples.

*The Sample must be representative of the bulk from which it was taken.*

When a water sample is taken from a tap, it is important to permit the tap to run for a few minutes so that the contamination from the outlet will be reduced to a minimum and the sample will be truly representative of the water supply. If a can of cream, or a vat of milk is being sampled it is essential that it be thoroughly stirred with a sterilized stirrer before the sample is taken. For all bacteriological samples it is of the greatest importance that no bacteria are introduced from sources outside the sample. Avoid pouring the sample over non-sterile surfaces. Avoid contaminating the portion of the stopper that fits inside the tube or bottle provided for the sample. Avoid contaminating the lip of the tube or bottle—in other words, avoid all adventitious contamination, as otherwise the results of the analysis will be of little value.

*Always use sterile containers when forwarding samples for bacteriological analysis.*

Unless the containers used are sterile it is impossible to interpret the results of the analysis the bacteriologist has no means of distinguishing which bacteria were present in the original sample, and those which might have been added from the container or from the stopper. Suitable containers can be obtained from the School of Dairy Technology, Werribee, if the applicant states the nature of the substance to be sampled, the reason why the analysis is required, and the approximate date on which the samples will be taken.

*Bacterial growth must be prevented between the time the sample is taken, and the time it is analysed.*

This growth may be prevented in either of two ways:—

(*a*) Ice.—If samples are packed in ice immediately they are taken from the bulk supply, very little growth will take place as long as an adequate amount of ice remains around the samples. Specially designed "ice boxes" with sterile tubes and stoppers are available on application. These are forwarded without ice. Generally speaking, ice is readily available at the local butter factory. A supply of ice should be placed in the ice box, together with about a half-pint of water, before the samples are taken. This will ensure rapid chilling of the samples. Before forwarding the ice box to the laboratory, empty out the water and repack the box with ice, preferably using two solid pieces cut to neatly fit the space provided for the ice. Such ice boxes are always forwarded by rail and the collection of samples should be, wherever practicable, arranged to fit in with the train services so that the minimum time elapses between collection and analysis of the samples. This procedure is adopted whenever it is necessary to isolate living organisms from the sample for diagnostic purposes, and when it is suspected that the bacterial content will be below, or beyond the range of accuracy of the microscopic method of examination.

(*b*) Formalin.—By the addition of formalin all the bacteria in the sample are killed, and the sample may be forwarded without ice. However, this limits the analysis to a microscopic examination, and although well-suited for the examination of milk for consumption as fluid milk, it does not permit the isolation of living bacteria, and therefore gives results with a restricted diagnostic value, as far as other samples are concerned. However, if the person requesting the analysis supplies details of the nature of the sample, and the reason why the analysis is requested, then facilities for taking the appropriate samples will be provided.

### *Veterinary Specimens*

Send to:—

The Director,
Veterinary Research Institute,
Corner Park and Story streets,
Parkville, N.2.

From time to time it becomes necessary for farmers to send specimens to the Department of Agriculture for diagnosis of varying conditions, or for the detection of poisons. Frequently these specimens are useless when they arrive in bad condition, due to improper packing or lack of preservative. To obviate this waste of time, money and labour, the following advice is given. Specimens should be consigned by rail in preference to posting them.

**Milk Samples (Suspected Mastitis).**—Milk samples should be collected from individual quarters into sterile bottles, preferably those obtainable on request from the Veterinary Research Institute. The udder and teats of the cow, and the hands of the person taking the sample, should be thoroughly washed with soap and water, and dried. The teats are then swabbed with methylated spirits, particular care being taken with the teat openings. Clean the *left-hand* teats before the right-hand; this prevents the sleeve of the collector from contaminating the right-hand teats after they have been cleansed. The milk bottles are held away from the vertical plane and samples are collected first from the *right-hand* teats and then from the left-hand. Milk samples should be labelled with the name and the quarter of the udder from which the sample was taken. In indicating the quarter, the terms "near" and "off" should not be used. Instead, the letters L.F., L.H., R.F., and R.H. (left-fore, left-hind, &c.) should be used.

In summer months duplicate samples should be sent, one sample having three or four drops of formalin added. Whenever possible, collect milk samples early in the week so that the examination can be completed without the intervention of a week-end.

**Animal Specimens.**—Specimens should be collected from animals as soon after death as possible. The specimens should be placed in a mixture of one cup of formalin to two gallons of water in an air-tight container from which no fluid can escape. Preserving bottles or kerosene tins are excellent for this purpose. If practicable the tins should be soldered before despatch. Specimens of foeti should be preserved by boracic acid.

If a specimen is too large for packing in an air-tight container, it could be wrapped in a damp cloth soaked in a mixture of two tablespoons of formalin to one pint of water. This should then be placed in a box which will not allow the leaking of excess fluid.

Faeces from animals suspected of worm infestation should be packed in an air-tight container without the addition of any preservative. Faeces should be collected from individual infected animals in preference to random samples taken from floor and yard.

In the case of large animals, such as horses and cattle, specimens of the following organs should be sent:—heart, lungs, liver, kidney, spleen, intestinal wall and any other part of the body which appears to be abnormal. In pigs, sheep and small animals send all the viscera including heart, lungs, liver, kidneys, spleen, and intestines in a water-tight container with formalin solution. The rumen or paunch of sheep need not be sent. Tie the intestines at each end before removing from the body to prevent contamination of the specimen by faeces.

If poisoning is suspected, the stomach contents should be sent in a separate container without preservative.

In the case of poultry it is preferable to send a live sick bird in a crate. Sometimes this can also be done with some of the smaller animals. If not possible, the bird's neck should be wrung and the bird sent wrapped in a formalin soaked cloth.

**Blood.**—Blood should be placed in sterile small bottles, tightly sealed and packed as directed under the heading, General Directions. Blood should always be taken from a live animal; blood from a dead animal is useless for a biochemical examination. Blood should be sent from cattle suspected of contagious abortion and contagious bovine pleuro-pneumonia, from sheep suspected of hypocalcaemia or pregnancy toxaemia.

**Wool.**—In infections such as "wet rot," it is necessary to send wool specimens; such specimens should be packed dry in a container. If it is necessary to send a sample of wool and under-lying skin infected for instance with "lumpy wool" or "mycotic dermatitis," it should be wrapped in a damp formalin cloth. Skin affected with dermatitis, erysipelas, or photosensitization should be treated in the same way.

**Miscellaneous.**—Parasites should be treated in the following way:—

In the case of ectoparasites such as fleas, ticks, flies, &c., they should be sent in a clean, well-stoppered bottle. Parasitic worms of various types should be sent in a clean bottle in water, dilute formalin solution or methylated spirits.

Skin scrapings should be forwarded in a clean bottle.

In "blackleg" in sheep and cattle, specimens of muscle should be sent only when there are definite skin and muscle lesions.

Where anthrax is suspected, no postmortem examination should be made. Specimens should not be sent, but the local Veterinary Officer or Stock Inspector should be notified at once. If it is necessary to take specimens, use great care as this disease is highly dangerous to man. Be careful not to soil the hand or clothes with any of the animal's blood. Cut an ear off as close to the head as possible. Place in a treacle tin or screw-top jar, using no preservative. Send urgent telegram to Director, Veterinary Research Institute, Parkville, Melbourne.

In botulism or forage poisoning, send the bones which the animal was chewing or any other suspected forage.

### *Plant Specimens*

*Horticultural Specimens for Identification*:

Send to:—

Superintendent of Horticulture,
Department of Agriculture,
Melbourne C.2.

*Agricultural Plant Specimens, such as Cereals, Grasses, Weeds and Seeds, for Identification*:

Send to:—

Agricultural Superintendent,
Department of Agriculture,
Melbourne, C.2.

*Horticultural and Agricultural Plant Disease Specimens and Insect Specimens for Identification*:

Send to:—

The Biologist,
Plant Research Laboratories,
Department of Agriculture,
Burnley, E.1.

If horticultural and agricultural crop plant specimens are showing some unsatisfactory condition, a letter describing the symptoms is not sufficient in itself but should be accompanied by specimens typical of the condition. The covering letter should describe the extent of damage, length of time during which it has been observed, soil and climatic conditions under which plant or tree has been grown, sprays and fertilizers used, portion of plant affected and any other relevant details.

The material should be as fresh as possible. An adequate quantity should be sent, exhibiting both early and late stages of the disease. Where possible, whole plants are preferable, as sometimes symptoms in the upper portions have been caused by disorders of the roots or of the collar region.

Plant specimens for identification should include portions bearing flowers or seeds, and roots too if possible. Quote the locality where the plant was found and the conditions under which it was grown. If the plant is suspected of having poisoned stock, the details of the effects on stock should be stated.

**Amount of Material to be Sent.**

General horticultural specimens not involving disease may also be forwarded for identification. Where such specimens as fruit or nuts are sent, at least three mature or full-grown fruits should be submitted. Specimens of foliage preserved as described below should be included, and such information as the habit of growth of the tree, i.e., spreading, upright, &c., dates of blossoming and ripening of the fruit which is useful information in identification, should be given. If information is desired on some damage to fruit, three specimens are required.

Foliage Specimens.

Two or three complete fruit-tree twigs carrying leaves showing typical disorders are required for satisfactory diagnosis. Four or five leaves of vegetables or, preferably several complete plants, including the roots, should be forwarded.

Trees.—If a portion or the whole of a tree is damaged, it may be necessary to send a specimen of root, trunk, or limb showing this injury.

**Method of Packing Samples.**

Specimens should be wrapped separately and placed in a strong cardboard or wooden box with sufficient other packing to prevent bruising in transit. Soft fruits, e.g., plums, peaches, grapes, or tomatoes, must be packed in a water-proof container.

[*Continued on page* 347.

# HANDLING OF BEES

## HINTS FOR THE NOVICE

By J. W. THOMLINSON, Apiary Inspector

Success in the manipulation of the interior fittings of a hive and the removal of surplus honey is dependent to a great extent on the confidence of the individual. Most people are naturally nervous when first making direct contact with a colony of bees, but a little practice will soon convince the beginner that, provided reasonable precautions are taken, bees may be handled quite safely, and with the risk of very little more than an occasional sting.

COLONIES vary considerably in temperament. To examine some, the bee-keeper will at times require no protection against stings, but will find it impossible to handle others without the subduing effect of smoke, and the protection of a veil. It is therefore necessary, with the object of guarding against the possibility of an unpleasant experience, to afford protection for the face, arms, and ankles, and to have a well-lighted smoker available before opening a hive.

The type of smoker recommended is that shown in Fig. 1. One may be obtained in which there is a barrel made of either brass or tin, and although it will cost a little more one with a brass barrel will probably prove more economical owing to ts lasting qualities. For general use the $3\frac{1}{2}$-in. iize is likely to be the most suitable.

Various materials may be used as fuel for the smoker. Some prefer bark, others wood shavings, or cotton waste, but in the opinion of the writer there is nothing better for producing a good even smoke than a strip of jute torn from a discarded wheat sack. Material from a sack that has been out in the weather, and which consequently may be easily torn, will be found to ignite more readily than a strip from a comparatively new one.

The best way to prepare jute for smoker fuel is to cut or tear it into strips of not more than 6 inches wide; these should be made into rolls slightly less than the diameter of the smoker barrel; a piece of string tied around the centre of each will keep it compact and ready for use.

When about to use the smoker, dip one end of the fuel roll in water, remove quickly and wring out; the damp end will act as a spark arrester,

Fig. 1. Contents of tool box:—1. Smoker; 2. Reserve smoker-fuel; 3. Claw hammer; 4. Pliers; 5. Hive tool; 6. Painter's scraper; 7. Screw driver; 8. Damp cloth; 9. Tins for nails.

ensure a cool dense smoke, and also prevent the fuel from burning too quickly. The other end must be lighted and placed in the smoker barrel, and the hinged nozzle closed, when a few puffs from the bellows should give the required smoke. To make sure that there will be no difficulty in keeping the roll alight, a few live coals from the kitchen fire may be placed in the smoker barrel before the fuel is inserted. On no account should an attempt be made to use the smoker until it is well alight and a steady stream of smoke available, as air or dust from the smoker when directed at the bees will cause irritation instead of subjection.

For the protection of the face a veil is necessary. This should be made of black mosquito netting, black being necessary for clear vision; it should be of such dimensions that when in use it will be well away from the face and the back of the neck. Small veils are often responsible for quite a lot of unnecessary stinging. A veil when finished should be about 30 inches square. One end should be hemmed to take a piece of elastic, which should be drawn tightly enough to fit snugly around the crown of the hat.

To arrange the veil, first remove the coat and vest; then place the elastic band around the crown of the hat and allow the veil to fall over the head and shoulders; replace the vest; and pull the material well clear of the face and back of the neck, and if desired replace the coat.

The arms may be protected by placing rubber bands over the coat sleeves at the wrist, but a much better way is to use gauntlets made from cotton material hemmed at each end and elastic inserted so that the gauntlets will fit neatly at the wrist and just below the elbow. This will give ample protection and prevent bees from getting under the sleeve of coat or shirt.

It is advisable to wear boots in preference to shoes when handling bees. Rubber bands, or leather cycling gaiters may be used to keep the bottom of the trousers tight against the boots. If shoes be worn, leather cycling gaiters are necessary, otherwise the ankles may receive quite a lot of attention from angry bees.

Rough woollen garments should be avoided, as nothing is more likely to cause bees to sting than their coming into contact with the rough surface of coarse woollen material. The operator wearing shoes should, therefore, be careful not to wear worsted socks.

It is quite possible to open the hive and examine the interior with no further aid than that rendered by the veil and smoker, but when a number of hives has to be overhauled, the work will be done more quickly and thoroughly with the help of a small kit of tools.

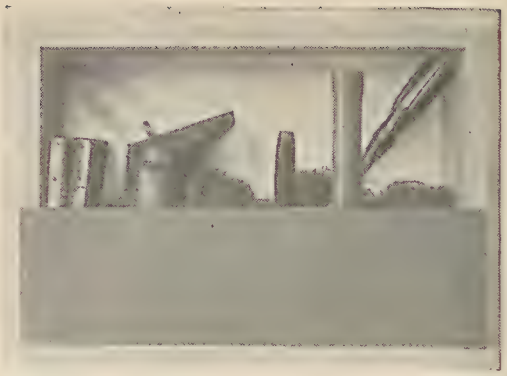


Fig. 2.—Discarded six inch super. converted into a combined seat and tool box.

A box should be provided to hold the required tools, and each article must be replaced immediately after using; this may save quite a lot of annoyance caused through the loss of implements, which if put on the ground, frequently get covered with grass, dust, or dried leaves, and may not be missed until again required.

A portable seat will obviate the necessity of kneeling on damp ground while combs are being examined in search of the queen; or if the operator be stooping over the hive for any length of time the use of a seat will relieve the strain on the muscles of the back and enable the work to be done without unnecessary fatigue.

Seats are generally dispensed with in the apiary owing to their bulkiness and the time occupied in shifting them, but as shown in Fig. 2, a discarded 6-in. depth super. can easily be converted into a convenient, light, and portable combined seat and tool-box, capable of holding the smoker when not in use, the necessary tools, nails, and reserve smoker-fuel. This can be done by nailing two 6-in. pieces of light wood, such as may be obtained from a petrol case, on the side of the super.

In Fig. 1 the contents of the tool-box are shown:—(1) smoker; (2) reserve smoker-fuel; (3) claw-hammer for effecting repairs to frames and hives; (4) pliers for removing nails that cannot be drawn with the claw-hammer; (5) hive-tool for separating frames and supers; (6) painter's scraper for quickly removing burr-comb from frames and sides of hives, and also propolis, a resinous substance gathered by the bees and used by them for sealing undesirable spaces; (7) 12-in. screw-driver, which some prefer to the

Fig. 3.—Opening the hive ; directing smoke at entrance.

hive-tool for separating frames and retrieving pieces of burr-comb from between frames ; (8) a damp cloth for removing honey from the hands ; and (9) tins containing an assortment of nails.

A small bucket of water should also be on hand for rinsing tools that come in contact with honey. The hands should be kept as free from water as possible ; immersing them in water softens the skin and thus, in the event of a person being stung, permits of a deeper and more rapid penetration than is the case where the skin is harder. For this reason, when one is engaged at the hives a damp cloth only should be used for the removal of honey from the hands.

It must be remembered that no matter how carefully a hive is opened a certain amount of disorganization of the colony with consequent loss of time will take place. Therefore, the use of the smoker should be restricted to the minimum necessary for the reasonable subjection of the members, and as soon as the work undertaken is finished, the hive should be closed again as quickly as possible.

The quantity of smoke necessary to subdue bees depends, to a certain extent, on the temperament of the members in each particular colony. The peculiarities of each hive will soon be learned by experience. Weather conditions and food supplies have also to be taken into consideration. Bees are usually more irritable during close thundery weather, and when there is a scarcity of honey, than at other times, consequently more smoke would be required under those conditions than during normal periods.

### *Opening the Hive*

To open the hive first make sure that the smoker is well alight, walk to the side of the hive from which it is intended to work, place the nozzle of the smoker near the entrance, press the bellows four or five times, directing the smoke well into the entrance (Fig. 3). After the space of half a minute repeat the operation, using about half the quantity of smoke, then raise the corner of the lid, lift the mat and direct a similar quantity of smoke along the top of the frames (Fig. 4). The lid and mat should then be removed.

It should be distinctly understood that the above direction regarding the quantity of smoke to be used would apply to an average colony, some may require more, others less ; the operator would have to use his own discretion as to the amount required.

After the lid and mat have been removed, direct a little smoke across the frames, but not directly into the hive unless this be found necessary ; place the smoker on the ground within easy reach, then with the hive-tool or screw-driver loosen the frames and remove one (the second from the far side is usually the most convenient), examine the comb on both sides,

Fig. 4.—Opening the hive ; directing smoke between frames.

then carefully place the bottom of the frame on the ground and lean the top against the side or back of the hive—on the shady side during warm weather (Fig. 5).

With one frame out of the hive, no difficulty will be experienced in separating the remainder, and concluding the examination. If the bees become troublesome, a little more smoke should be gently directed over the frames; then proceed quietly and avoid all quick movements. As each comb is examined it should be replaced in the hive; care is essential to see that bees are not crushed when closing the end bars of the frame.

Fig. 5.—The hive opened.

When the examination has been completed, press the frames together, leaving a space for the one first removed; this frame should now be lifted with the palms of the hands against the end bars and the thumbs locked over the projecting ends of the top bar (Fig. 6). While held in this position, if the weather be warm, the bees should be dislodged in front of the hive by sharply jolting the frame downwards (Fig. 7). After being dislodged the bees will find their way into the hive through the entrance; the frame should then be replaced and the hive closed. Should the weather be at all cold, or evening be approaching, and the young ones in danger of becoming chilled before finding the entrance to the hive, the bees should be dislodged on top of the frames and driven below with a few light puffs from the smoker.

Fig. 6.—To dislodge bees from the comb; note position of the hands.

### *The Sting*

To the naked eye a bee sting is merely a small dark-brown object with a ball of greyish matter attached to the base, but a miscroscope will show that it is composed of three parts, two of which are barbed and joined to the third by means of

Fig. 7.—Bees dislodged from the brood comb.

partly closed grooves. At the base of the sting, with an outlet along a groove, is a small sac containing a clear liquid. Should the sting be driven into a substance capable of engaging the barbs and offering resistance to its withdrawal by the controlling muscles, the bee becomes a prisoner, securely held by its own sting. Immediately the insect realizes this its whole strength is brought into action in a frantic effort to get free, with the result that the sting and surrounding muscles, and sometimes other organs, are torn from the body, and left behind, an injury which must ultimately prove fatal to the bee.

On being stung by a bee one feels a sharp burning sensation and at once the small ball of greyish matter attached to the affected spot can be seen. On no account should an attempt be made to remove the sting by taking the visible matter between the thumb and forefinger; it should be removed immediately by being scraped away with the finger nail. The grey matter will be composed of muscles, still actively working, and the sac containing liquid which, when injected into the puncture made by the sting, is responsible for the pain.

Unless stung on such sensitive places as the tip of the nose or lobe of the ear, the severity of a sting is governed by the amount of liquid injected into the puncture; so it should be quite obvious that any movement to remove the visible matter except by scraping the injured part, will have the effect of compressing the sac and forcing the liquid along the groove of the sting into the puncture.

In the event of a severe case of stinging and subsequent swelling, the application of hot foments will afford relief. To relieve the effect of a casual sting, except for the application of heat, very little can be done in the way of applying remedies, owing to the smallness of the puncture made by the sting; though tincture of iodine, if applied immediately, may afford a certain amount of comfort.

## SAMPLES FOR ANALYSIS AND EXAMINATION—*Continued from page 342*

If leaves as well as fruit are forwarded together, each should be wrapped separately. Leaves should be pressed out flat between two moist sheets of blotting paper or newspaper and wrapped in several folds of paper. Leaves which are rolled up in a paper seldom reach their destination in a satisfactory condition for examination. It is emphasized that specimens should be fresh and despatched by parcel post where possible.

**Insect Specimens.**

Insect specimens for identification do not present much difficulty as to packaging. Large insects can be sent in any suitable container, but small or active insects should be placed in a well-stoppered tube or jar of methylated spirits.

# THE YOUNG FARMER ANNUAL

The *Young Farmer Annual*, 1944, edited by H. C. F. Morant. (The "Young Farmer", 360 Collins-street, Melbourne, price 3s. 6d., postage 2½d.)

Secretaries of Young Farmer Clubs and those interested in rural life who desire to obtain copies of the *Young Farmer Annual* are advised to lodge their applications as soon as possible. The annual has been specially prepared for Young Farmers and much of the matter is useful for supplementary reading and for the preparation of written projects. The Annual contains 72 pages of well-illustrated articles by recognized authorities. Illustrations of popular breeds of cattle, sheep, horses, pigs, and poultry are given, as well as articles on forestry and soil erosion.

# IN THE ORCHARD

Compiled by T. H. KNEEN, B.Agr.Sc., Senior Horticultural Instructor,
and G. W. GAYFORD, B.Agr.Sc., Horticultural Instructor

### *Fewer Apples Grown*

TWENTY years ago, Victoria had just over 30,000 acres of land under apples, of which nearly 25 per cent. was classified as non-bearing (young trees). To-day we have only 22,000 acres of which barely ten per cent. is classified as non-bearing. The decline in total area commenced about 1931 and has continued steadily until the present time. The number of trees in bearing remained fairly stable for a further five or six years after which fresh plantings were insufficient to maintain the area under production. These trends are shown graphically in Fig. I.

The maximum average production during this twenty-year period occurred during the years 1932–3 to 1937–8 when production averaged two and a half million bushels. Before that period yields had fluctuated violently and the average production was less than two million bushels. Since the high-production period, the average annual production has again fallen to less than the two million mark. With the decline in number of trees in bearing, it is likely that total annual production in excess of two million bushels will be the exception rather than the rule. In view of the violent fluctuations in production it is rather misleading to speak of average production, as a glance at Fig. 2 will show.

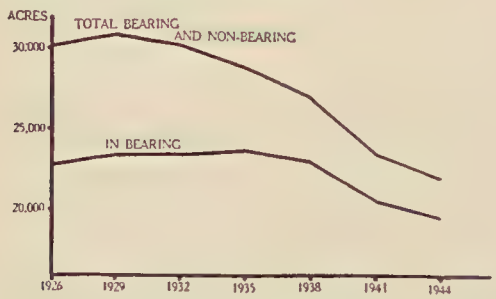



Fig. I.—Showing decline in the area under apples 1926 to 1944.

Some important changes in the varietal composition of the industry have occurred, largely to meet the requirements of the export markets. Jonathan is by far the leading variety comprising about 33 per cent. of the varieties grown, compared with nearly 40 per cent. in 1926. Granny Smith has increased in favour from 500 acres in 1926 to nearly double that area at the outbreak of war. The only other leading varieties which have increased are

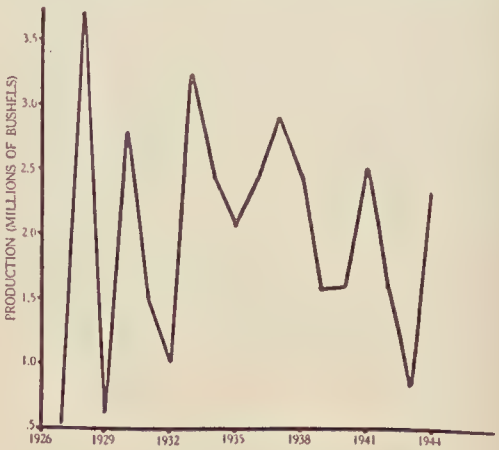



Fig. 2.—Showing production of apples (in bushels) 1926 to 1944

Ballarat and Democrat. Among the varieties which have slumped heavily are Rome Beauty, London Pippin, and Yates.

### *Irrigation at Cobram*

The article "A Message to Irrigators—Problems at Cobram," by R. S. Harper, B.Agr.Sc., Manager, Horticultural Research Station, Tatura, which appeared in the February issue of this Journal, is now available as a pamphlet, and is obtainable free of charge on application to the Director, Department of Agriculture, Melbourne, C.2.

The article is a report on preliminary work done at Cobram and draws attention to the dangers of faulty irrigation practices and their influence on the soils of Cobram and similar areas. Even at this early stage of development of the Cobram district, rapid alteration in the soil structure is taking place under irrigation. Such problems as the length of the run, the amount of water required, system of watering (whether by furrows or check banks, &c.), cultivation practices and the provision of humus in the soil must be studied. All irrigators should possess a copy of this useful report.

### *Nitrate of Soda v. Sulphate of Ammonia*

Sulphate of ammonia continues to be in short supply. Nitrate of soda, however, is available for use by fruitgrowers, but there appears to be a certain amount of prejudice against the use of this fertilizer. One hears any number of statements concerning this fertilizer, such as, "nitrate of soda is only a tonic," "it burns up the humus," or "it sours the soil." Most of these statements, however, are without justification.

Let us examine the action of this artificial fertilizer more closely. All experimental work supports the view that fruit trees on most soils require nitrogen for health and productivity. Soils naturally contain nitrogen, but it is not until this nitrogen is changed into the nitrate form that it becomes available to the tree. This change requires a certain amount of activity by soil organisms. Nitrate of soda contains nitrogen already in the form of nitrate and as such is directly available as a plant food. Nitrate of soda, therefore, is only a means of supplementing the amount of nitrate already available in the soil. As this amount is usually small on fruitgrowing soils, this fertilizer can be looked upon as a valuable plant food.

Some advice concerning its use may be helpful. First, it can be easily washed out of the soil by heavy rain or irrigation. It should be used sparingly, therefore, and applications of 2 lb. per tree at a time, are sufficient. If more is available, a similar quantity should be applied a month or so after the first application. It should be applied when the tree can best make use of it, i.e., just before blossoming for preference, although later applications may be made until December.

Because the effect of nitrate of soda on the soil is to increase its alkalinity or decrease its acidity, it should not be used on soils which are already alkaline. Such soils occur in the Murray Valley irrigated fruit districts. Most other Victorian soils are acidic and, therefore, nitrate of soda may be used on them with advantage.

Sulphate of ammonia can be used on all classes of soils. Its chief differences from nitrate of soda are that the nitrogen is not as readily available because it is in the form of ammonia which has to be changed to nitrate, and it is not leached from the soil as rapidly, due to its retention by the clays.

During war-time, the supplies of sulphate of ammonia have been restricted for use on crops of high priority and in mixed fertilizers.

### *Apricot Scab or "Shot Hole"*

A common disease of apricots, Apricot Scab or "Shot Hole," causes spots on leaves and fruit. The infected areas on leaves fall out leaving small round holes giving the shot-hole effect. Fruit infection results in small hard scales which spoil the appearance of the fruit for marketing or canning. A spray of Bordeaux mixture at leaf fall is required to protect the buds. As spores of the fungus overwinter in the bud scales, a further Bordeaux spray, 6:4:40 should be applied at the "pink-bud" stage, i.e., just as the tips of the petals appear in the spring.

### *Peach Leaf Curl*

Peach and nectarine trees should be sprayed with Bordeaux mixture, strength 6:4:40, at the pink bud stage for the control of leaf curl, a fungous disease which causes a thickening and curling of the leaves. Thorough spraying is required otherwise a portion of the tree which is missed may be the source of an infection which will spread, particularly during showery weather.

### *Black Spot in Pears*

The fact that there has been no serious infestation of black spot in pears for a number of years should not deter growers from applying protective sprays for the control of this disease. For Williams' and Beurre Bosc varieties, apply 6:4:40 Bordeaux at the green-tip stage and again at the finger stage, i.e., when the clusters of blossom buds are commencing to separate, but before the white petals appear. A further spray of Bordeaux at strength 3:3:50 should be given at a stage about three weeks after petal fall.

The Winter Nelis and Madame Cole varieties should receive this programme, but the "finger" stage spray should be completed before any pink petals appear. For Packham's and other clean-skinned varieties the same strength Bordeaux should be used at the "green tip" and "finger" stages, but the strength should be reduced to 1:1:50 for the spray after petal fall. The varieties Josephine and Winter Cole should be sprayed only at an early "green tip" stage with 6:4:40 Bordeaux. Later sprays would russet and crack these varieties.

# THE FLOWER GARDEN

By J. L. Provan, B.Agr.Sc., Principal, School of Horticulture, Burnley Gardens

### *Pruning Flowering Trees*

DURING and immediately after flowering is the best time to prune the various flowering fruit trees in the garden. One of the earliest of these is *Prunus Mume*, the flowering apricot, which usually flowers during June and July, followed by some of the flowering plums, which in turn are followed by the flowering peaches.

In some cases pruning must be heavy to keep the tree from outgrowing the space allotted to it. At other times it is necessary to thin out the top of the tree rather severely to encourage the growth of laterals on the lower limbs. If the tree becomes too dense at the top, growth on the lower limbs is partially, or wholly, suppressed and in time these become quite bare. By judiciously thinning out the flowering shoots during blossoming, light is admitted to the tree and encourages healthy growth of laterals on the lower limbs.

In cutting back the flowering peaches either during or after blooming, care should be taken that basal growth buds are left on the main branches. By cutting the flowering limbs off too close to the main branches bare spaces appear in the tree and it is difficult, later, to encourage new growth from these parts of the limbs.

### *Garden Beds*

Garden beds where annuals are to be planted out should be prepared by digging in a quantity of well-decomposed manure or compost, together with a little blood and bone or complete fertilizer, at the rate of about 2 or 3 oz. to the square yard. It is a very good practice to prepare these early and allow the soil to settle before transplanting the young seedlings.

Herbaceous perennials may be lifted, divided and replanted now. These perennials will include :—delphinium, helenium, rudbeckia, perennial salvias, lupins, perennial aster, perennial phlox, and canna.

Most of the abovenamed perennials will need protection from slugs and snails, particularly the delphiniums and phlox. Cinders or ashes spread around the crowns, or a dusting of lime, or the use of a metaldehyde bait, will provide adequate protection.

### *Seed Sowing*

Seeds of any of the following plants may be sown now :—aster, antirrhinum, carnation, delphinium, dianthus, geum, lupins, verbena, scabious, and wallflower. These may be sown either in seed beds or seed boxes, and if the seed is not sown too thickly, good sturdy plants for transplanting will be obtained.

In addition to seed sowing this month, various perennial plants can be put out in the garden—carnations, delphiniums, and aquilegia.

### *Lawns*

August is a good month to top-dress lawns with sandy soil. If it is desired to apply fertilizers to the lawns, this may be mixed with the top-dressing before i is applied. $\frac{1}{4}$ to $\frac{1}{2}$ inch thick of top-dressing for the whole area should be provided for a flat lawn, but if the lawn is not level, an extra quantity will be required to fill depressions. Sulphate of ammonia $\frac{3}{4}$ oz. per square yard, and sulphate of iron $\frac{1}{4}$ oz. per square yard of lawn can be added to the sand which is to be used as a top-dressing. Lime is not required by grasses, and a purer sward of grass will be maintained if lime is used sparingly, if at all. Buffalo lawns which have become "springy" should be top-dressed.

Before applying the top-dressing, cut the lawn carefully, preferably cutting in two different directions. The soil should be spread over the surface and rubbed into the lawn with the back of a rake until the grass shows through. Bare patches in lawns can be lightly forked and a small quantity of seed sown in these patches, or runners of buffalo or couch can be placed in them if the lawn is composed of one of these varieties.

Established lawns which may not need top-dressing this spring, but which it is desired to fertilize, can be manured with about $\frac{3}{4}$ oz. of sulphate of ammonia per square yard and $\frac{1}{4}$ oz. of sulphate of iron. It is advisable to mix these fertilizers with a small quantity of sand and to apply sand and fertilizer in three equal amounts over the lawn, each time working in a different direction across the lawn. In this way an even distribution of the fertilizer is obtained. This mixture will intensify the green colour of the grass.

## THE VEGETABLE GARDEN

### Cabbages

Young seedlings of *Parisian* cabbage can be planted this month in well-prepared soil. Dig in a plentiful supply of well-decayed manure or compost, and add about 2 to 3 oz. of blood and bone or market-garden fertilizer to each square yard of the bed. Space the plants 2 feet apart in rows which are 2 ft. to 2 ft. 6 in. apart. The young plants will need to be protected from cabbage moth and the cabbage white butterfly, by dusting or spraying with arsenate of lead at regular intervals of about a fortnight. This treatment will apply also to other cabbage plants which have been planted earlier in the season.

### Silver Beet

The first sowing of seed of *Fordhook Giant, Lucullus,* or *Dark-Green Broad-ribbed* varieties of silver beet can be made this month. It is preferable to make this sowing in a seed-bed or seed-boxes in a warm situation. Cover the seed with about ¾ inch of fine sandy soil. Seedlings raised now will be ready for transplanting in October.

### Lettuce

Seed of *Iceberg* and *Mignonette* varieties of lettuce can be sown in seed beds or seed boxes late this month. Cover the seed with fine soil to a depth of not more than ½ inch.

### Tomatoes

Although most home gardeners buy their tomato plants, some prefer to raise their own seedlings, and an early sowing of tomatoes can be made late this month. It is very necessary that such a sowing should be protected from frost, and the seed-beds or seed-boxes must be in a warm, sunny position. Suitable early varieties are:—*Burwood Wonder, South Australian Dwarf, Rouge de Marmande, Sunnybrook Earliana.*

The seed is best sown in seed-boxes in a slightly acid soil; the tomato grows better in a slightly acid soil, and therefore it is not advisable to apply lime to soils which are going to be used for growing tomato plants. A better practice is to dig in plenty of well-decayed compost or manure, together with superphosphate, 2 oz. per sq. yd. and sulphate of potash ½ oz. per sq. yd.

### Peas

*Green Feast.* and *Richard Seddon* varieties of peas can be sown now in rows about 20 inches apart with about 2 to 2½ inches between the seeds. Sow the seed in drills about 2 inches deep and cover with about 1½ inches of soil. As soon as the young seedlings appear they should be protected from birds with bird-scaring devices such as potatoes with feathers stuck in them and swinging from a stick, or shining tin lids swinging freely. If available, a covering of bird-mesh wire-netting is a very positive way of preventing birds from damaging the young seedlings. Another method practised by some home gardeners is to stretch about two or three lengths of black cotton along the drill rows about 2 or 3 inches above the soil.

### Onions

Onion varieties sown in June and July should be thinned out, when they are 4 to 5 inches high, to 3 to 4 inches apart. At thinning time it is a good plan to remove any small weeds.

### Carrots and Parsnips

Early sowings of carrots have not been very successful of late years. Almost invariably they become attacked by a virus disease which causes discoloration of the foliage and severe stunting of the plant. The young seedlings do not appear to recover their normal vigour once infection takes place. Later sowings made in November and December are usually more successful. Where early sowings will succeed, *Short Horn, Danver's Half Long, St. Valery,* and *Red Chantenay* would be suitable varieties. Sow the seed in drills 18 inches apart and cover the seed to a depth of ½ inch.

*Hollow Crown* parsnip can be sown now in drills about 24 inches apart, covering the seed to a depth of ½ inch.

### Red Beet

Sow seed of *Detroit Dark Red* and *Crimson Globe* varieties of red beet in drills, spacing the rows 18 inches apart and covering the seed to a depth of ¾ inch.

### Potatoes

About the middle of the month plantings can be made of the following early potatoes:—*Katahdin, Earliest of All,* and *No. 1 Carman.* Space the rows about 24 inches apart with about 14 inches between the plants. Each piece of "seed" should be about 2 oz. in weight and should be planted about 4½ to 5 inches deep.

Old well-decayed manure or compost can be dug into the ground prior to planting, and the addition of about 3 oz. per square yard of a mixture of 6 parts of "super." and 1 part of sulphate of ammonia, will be found useful. The potato like the tomato prefers an acid soil; therefore do not apply lime or wood ashes to beds where it is intended to plant potatoes.

# Grapefruit Storage Trials

By G. B. TINDALE, B.Agr.Sc., Cool Storage Research Officer

DURING the summer months there is a demand for grapefruit which can be met only by storage of part of the previous spring crop. To provide for the summer market, it is desirable to store grapefruit for periods up to three months. For storage to be regarded as successful, not only is it necessary to keep the fruit free from mould attack and the skin free from rind blemishes, but it is necessary also to maintain the appearance of the fruit, i.e., there should be no obvious shrivel and the skin should be bright and not dull. Finally, the taste of the fruit should be normal with no suggestion of "off" or stale flavours.

Some few years ago when a glut of grapefruit was experienced in Melbourne, the position was met by placing the surplus in cool storage. The grapefruit were placed alongside apples and pears, which are normally stored at or near 32°. When so stored the grapefruit rapidly collapsed and it was realized that "apple and pear temperatures" were unsuited to grapefruit.

It was only after several years' experimental work that it was found that for successful storage local grapefruit required the comparatively high storage temperature of 55°F. When stored at somewhat lower temperatures, i.e., in the forties, although the fruit may show no signs of collapse, yet more or less severe rind disorders develop. When severe, large areas of the rind dry out, become sunken and often discoloured. When slight, the dried-out, sunken areas usually appear as pits, sometimes numerous, sometimes not.

When stored at 55°, however, these rind disorders do not appear, while the flavour remains quite normal. As a storage temperature, however, 55° is high, and after grapefruit have been stored at that temperature for, say, three months, the fruit usually shows considerable shrivel, and the appearance and hence market value greatly deteriorate even though the flavour may still be excellent.

To overcome this shrivelling, skin coatings have been developed in recent years and there is now evidence that, by the use of suitable coatings, obvious shrivel may be overcome. It is now hoped that it may be possible to find a suitable fungicide, which, when added to the skin coating emulsion, would overcome the problem of mould development in stored citrus. The position to-day is that the development of moulds—usually the common green or blue moulds (*penicillium* sp.) is the limiting factor to the successful storage of grapefruit.

The only known method of more or less preventing mould attack in stored citrus is by careful handling during the picking and packing operations. Even with the most careful handling, however, it seems that odd fruits receive scratches (for the skin of freshly picked citrus is very turgid) and mould spores sooner or later alight in such injuries, germinate, and ultimately the fruit goes mouldy. The period which elapses between entry of the spores and when the fruit ultimately goes mouldy may be quite considerable and depends on such factors as depth of injury and temperature. It generally happens then that while the injury and inoculation take place during picking or packing operations, mould development does not show up until the fruit has been stored for a week or two. If the mouldy fruits are not removed at intervals during storage, they will eventually set up nests of mould within a case and a very large percentage of the fruit may thereby be lost. It would seem desirable to examine stored citrus for the above reason at monthly intervals, and discard the mouldy fruit.

During the last spring and summer the Federal Citrus Council of Australia placed at the disposal of the Victorian Department of Agriculture some 60 cases of grapefruit for storage trials with the object of trying out the use of some of the fungicide-containing skin-coating emulsions, two of which were available in Melbourne, i.e.—

A. A proprietary emulsion containing paraffin and other wax and to which 5 per cent. borax as a fungicide was added.

B. A proprietary emulsion of various waxes to which 0·25 per cent. "Shirlan" as a fungicide was added.

For the above trial, 30 cases of Merbein grapefruit were made available during the first week of October and another 30 cases during the first week of December. Both lots were treated at Merbein as follows:—

10 cases dipped in Emulsion A.
10 cases dipped in Emulsion B.
10 cases not dipped (controls).

The fruit was then forwarded by rail to the Government Cool Stores, Melbourne, and stored in the Experimental Chambers at 55°. The fruit was examined after two months' and again after three months' storage and all mouldy fruits removed. After three months' storage the sound fruit was packed and sold.

## Results

None of the fruit developed any skin blemishes. This may be ascribed to the adoption of a suitable storage temperature, i.e., 55°. After three months' storage (but not after two months) shrivelling and dull appearance of the skin were quite pronounced in the control fruit not dipped, and also in those dipped in Emulsion A. Those dipped in Emulsion B, even after three months' storage, were still remarkably fresh in appearance and did not show any obvious shrivel.

The limiting factor to successful storage was mould development, nearly all due to the common blue or green mould (*penicillium* sp.). Results concerning mould attack were as follow:—

| Picking. | Treatment. | Percentage of Mouldy Grapefruit— After Two Months' Storage at 55°. | Percentage of Mouldy Grapefruit— After Three Months' Storage at 55°. |
|---|---|---|---|
| 1st week in September | Dipped in A | 13 | 24 |
| | Dipped in B | 12 | 23 |
| | Not dipped | 37 | 52 |
| 1st week in December | Dipped in A | 5 | 12 |
| | Dipped in B | 7 | 16 |
| | Not dipped | 5 | 13 |

## Discussion

From the table it will be seen that the incidence of mould was very severe in both the treated and the control fruit in the September pick, but the incidence was reduced to less than half (but by no means eliminated) where the fruit was dipped in the fungicide-containing emulsions. The September-picked fruit had been affected by frosts, which were severe last year, and it would seem that when so affected the fruit is unsuitable for storage. It is suggested that frosting of the growing grapefruit may, in a similar manner to cool storage at too low a temperature of any fruit, weaken the vitality of the fruit and render it more liable to mould attack and hence unsuited for storage.

The fruit of the December-picked fruit was considered to be normal fruit, and the incidence of mould attack was very much less than in the September-picked fruit. In the December-picked fruit, however, there was no evidence that mould was reduced by the use of the fungicide-containing skin-coating emulsion.

## Summary and Conclusion

The conclusions to be drawn from this relatively small-scale storage experiment with grapefruit are that grapefruit can be kept in excellent condition for a period up to three months, provided they are stored at a suitable temperature (55°) and coated with a suitable skin-coating emulsion to prevent shrivelling of the fruit and to preserve the bright appearance of the skin. The emulsion "B" was found to be very effective in that regard. Development of the common green and blue moulds proved to be the limiting factor to successful storage. Mould attack was very severe in the September-picked fruit and this is probably connected with the fact that the September-picked fruit showed evidence of having been affected by frosts.

In the September-picked fruit, there was evidence that the inclusion of a fungicide in the skin coating emulsion considerably reduced mould attack, but no such reduction was evident in the December-picked fruit.

It is apparent that much further experimenting is required with fungicide-containing skin-coating emulsions before any definite recommendations could be made concerning their use.

# WILT DISEASE OF FLAX

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THE FIRST PART OF THIS ARTICLE APPEARED IN THE JULY ISSUE OF THE JOURNAL

### *Selection of Wilt Resistant Strains of Flax*

The method of selection has been used with considerable success in the development of wilt resistant strains of flax. Barker (1923) found that resistant plants could be obtained immediately by selection in the field. Such plants bred true for resistance. Not all varieties contained resistant genotypes, however, so that the production of resistant strains must be restricted to those varieties in which there are such genotypes.

As a result of the varietal resistance tests described above, suitable material has been found for use in a flax-breeding programme designed to produce wilt and rust resistant flax varieties suitable for Victorian conditions.

It was also considered desirable to attempt the selection of wilt resistant strains from flax varieties which had proved to be suitable to local conditions. Such selections would be useful on their own merits, and would also be valuable for back-crossing purposes in the breeding programme.

Most work was done with the varieties Liral Crown and Liral Prince.

#### Method.

Large numbers of plants of the selected varieties were grown in "wilty" Drouin D1 soil maintained at 75° F. in the Burnley temperature tanks. The very few plants which survived after growing for approximately 6–8 weeks under these conditions were transplanted to "wilty" soil in the "bird cage".

"Bird Cage" Tests.—After harvest, all seed from surviving selections was immediately sown in "wilty" D1 soil in the "Bird cage" together with seed of the parent variety, to compare the relative wilt reactions of parent and selection. The first sowings were made during January, but a further test was subsequently made in which the seed was sown in June, which is the normal practice in Victoria. The numbers of plants germinating were recorded and the percentage of wilt was later determined at frequent intervals. The conditions prevailing for the succeeding two months after the summer sowing ensured high soil temperatures, thus encouraging the incidence of wilt. Throughout the "Bird cage" tests daily, maximum and minimum soil temperature readings at a depth of 2 inches were taken.

Temperature Tank Tests.—When sufficient seed was available, wilt resistance tests were conducted in the temperature tanks. Soil from both the D1 and D2 wilt-infected areas respectively at Drouin was placed separately in pots in the temperature tanks and maintained at a constant soil temperature of 75° F. The surface of each pot was divided by small sticks into two or three equal areas. Seed of the selection to be tested was sown in one of these areas, and the remaining areas were sown with seed of Concurrent and the parent variety respectively for control purposes. In some tests, only one of these varieties was included. The number of plants germinating in each section was recorded. After the appearance of wilt disease, infected plants were counted and removed at frequent intervals, and the wilt percentages, based on the germination counts, were calculated. From this data, the curves shown in Fig. 11 were drawn.

Meanwhile, seed of the selections was bulked as rapidly as possible. This was done by growing at least two generations per year for the two years subsequent to selection.

Field Test.—In March, 1944, an area for the field test was selected on the farm of Mr. G. H. Mitchell, at Drouin, on the original D1 site. The area was immediately sown with Concurrent to build up the wilt infection in the soil. This sowing developed approximately 75 per cent. of wilt before the winter temperatures became unfavorable to the disease. The remaining flax was then ploughed under and the ground left fallow until the following November, when the Liral Crown selections were sown in drill rows each 1½ chains long by 3 to 5 rows wide. Check plots of Liral Crown parent strain were

TABLE 1.—RESULTS OF TESTS OF THE WILT RESISTANCE OF LIRAL CROWN SELECTIONS GROWN IN "WILTY" DROUIN (D1) SOIL.

| Strain. | "Bird Cage" Tests. | | | Field Test. | |
|---|---|---|---|---|---|
| | Summer Sowing. | | Winter Sowing. | Summer Sowing. | |
| | Germinated 4th January, 1943.* | | Germinated 5th June, 1943. | Germinated 30th November, 1944. | |
| | Wilted Plants After:— | | | | |
| | 25 Days. | 50 Days. | 190 Days. | 20 Days. | 50 Days. |
| | % | % | % | % | % |
| Liral Crown Parent Strain .. | 88 | 99 | 75 | 69 | 99 |
| Liral Crown Selection 1 .. | 40 | 52 | 0 | 3·5 | 4·7 |
| " " " 1—1 .. | .. | .. | 0 | 5·4 | 8·4 |
| " " " 1—2 .. | .. | .. | 0 | 2·9 | 8·3 |
| " " " 1—3 .. | .. | .. | 0 | 2·4 | 6·0 |
| " " " 1—4 .. | .. | .. | 0 | 5·0 | 5·8 |
| " " " 1—5 .. | .. | .. | 0 | 1·3 | 8·0 |
| " " " 1—6 .. | .. | .. | 0 | 3·1 | 4·1 |
| " " " 2 .. | 34 | 40 | 0 | 3·8 | 4·5 |
| " " " 2—1 .. | .. | .. | 0 | 1·4 | 3·0 |
| " " " 2—2 .. | .. | .. | 0 | 3·0 | 3·5 |
| " " " 2—3 .. | .. | .. | 0 | 2·4 | 3·3 |
| " " " 2—4 .. | .. | .. | 0 | 1·0 | 2·0 |
| " " " 2—5 .. | .. | .. | 0 | 1·4 | 1·7 |
| " " " 2—6 .. | .. | .. | 0 | 4·2 | 4·6 |
| " " " 2—8 .. | .. | .. | 0 | 4·8 | 5·4 |
| " " " 3 .. | 40 | 41 | 0 | 3·4 | 4·0 |
| " " " 4 .. | 32 | 44 | 0 | 1·6 | 1·6 |
| " " " 4—1 .. | .. | .. | 0 | 3·8 | 4·0 |
| " " " 4—2 .. | .. | .. | 0 | 3·4 | 3·8 |
| " " " 5 .. | 37 | 43 | 0 | 5·6 | 6·6 |
| " " " 5—1 .. | .. | .. | 0 | 5·4 | 6·3 |
| " " " 5—2 .. | .. | .. | 0 | 4·0 | 4·8 |
| " " " 6 .. | 47 | 47 | 0 | 1·4 | 1·8 |
| " " " 6—1 .. | .. | .. | 0 | 3·2 | 4·0 |
| " " " 6—2 .. | .. | .. | .. | 3·8 | 4·6 |
| " " " 6—3 .. | .. | .. | .. | 3·2 | 3·8 |
| " " " 11 .. | 0 | 0 | .. | 1·6 | 4·6 |
| " " " 12 .. | 0 | 33 | .. | 3·4 | 5·2 |
| " " " 14 .. | 44 | .. | .. | 6·4 | 8·3 |
| " " " 15 .. | 0 | .. | .. | 1·0 | 1·8 |
| " " " 15—1 .. | .. | .. | .. | 1·0 | 1·6 |
| " " " 17 .. | 14 | .. | .. | 5·6 | 5·9 |
| " " " 17—1 .. | .. | .. | .. | 5·4 | 6·3 |
| " " " 18 .. | 56 | .. | .. | 2·0 | 2·6 |
| " " " 20 .. | .. | .. | .. | 5·4 | 6·4 |

* All the seed from the original single plant selections was used in this sowing.

sown every third plot. Some Concurrent check plots were also included. A soil thermograph was installed near the site of this experiment. The records showed that, subsequent to sowing, soil temperatures favorable to the development of wilt occurred.

After germination, and before the appearance of wilt disease, lengths of drill row, each containing 500 plants, were pegged in each plot. The plants surviving in these lengths were subsequently counted at intervals, and the percentage of wilt determined.

## Results.

### (1) *Liral Crown.*

Approximately 40 single plant selections of Liral Crown were transplanted to the "Bird cage" in September, 1942, after surviving for eight weeks in infected D1 soil maintained at a

constant temperature of 75° F. However, at harvest, only 18 plants remained. All the others had succumbed to wilt at varying periods after transplanting.

"Bird Cage" Tests.—The first wilt resistance test made on these selections was a summer sowing which germinated on 4th January, 1943, in the "Bird cage," under very favorable soil temperatures for wilt development. The disease first appeared in the control rows approximately ten days after germination. The subsequent development of wilt is shown in Table 1. Further individual sub-selections were made during this test. This first summer sowing was of all seed from the original single plant selections. The high percentage of wilt in this test compared with that in a subsequent summer sowing suggests that some further segregation for wilt resistance may have occurred in this sowing, enabling the elimination of susceptible individuals.

Fig. 10—Wilt resistance of Liral Crown Selections (approximately 4 per cent. wilt) (left and right) compared with the complete susceptibility of the parent strain (centre) in an "out-of-season" summer sowing on a naturally infected area at Drouin, during which temperature conditions very favourable for wilt infection occurred. Photographed approximately five weeks after germination.

In a winter sowing which germinated on 5th June, 1943 (see Table 1), the first signs of wilt occurred in the control rows 170 days after germination or about four weeks before the plants were ripe. Such plants showed "premature ripening". They turned brown in colour instead of showing the yellowing associated with normally maturing stems. On the other hand, no wilt was observed in any of the selections (Table 1).

Field Test.—The full range of selections and sub-selections was tested for the first time in the 1944 summer sowing at Drouin. Within 20 days of germination, the Concurrent control plants in this test were almost 100 per cent. wilted, and the Liral Crown controls showed 69 per cent. of wilt. Very little variation in the amount of wilt in the control plots occurred throughout the whole area.

The relative development of the disease in the selections is set out in Table 1.

The appearance of a portion of the experiment approximately five weeks after germination is shown in Fig. 10.

In this "out of season" summer sowing the general growth of the plants was not great, due to the rather dry conditions experienced. Flowering commenced within 40 days and the seed was ripe within 2½ months of germination.

The "bird cage" and field tests described above have demonstrated that the Liral Crown Selections possess a high degree of resistance under field conditions in Victoria.

Temperature Tank Tests.—The results of the tests with certain of the selections in D1 and D2 soils respectively maintained at 75° F. in the temperature tanks are shown in Fig. 11. The results were essentially the same for all selections tested.

Comparing these results with those from the field tests, it is seen that the severity of the disease is much greater under temperature tank conditions than under field conditions. The rate of wilt development in the controls is also much more rapid in the tank tests. This is an important feature in the interpretation of such results. The selections have shown similar reactions to *F. lini* D1 and *F. lini* D2.

The type of temperature tank reaction exhibited by the selections places them in Wilt Class 2, and shows that they possess considerably less resistance to wilt than Russian x Argentine. Royal D1 Selection (see Fig. 7) or the other varieties included in Wilt Class 5. The fact

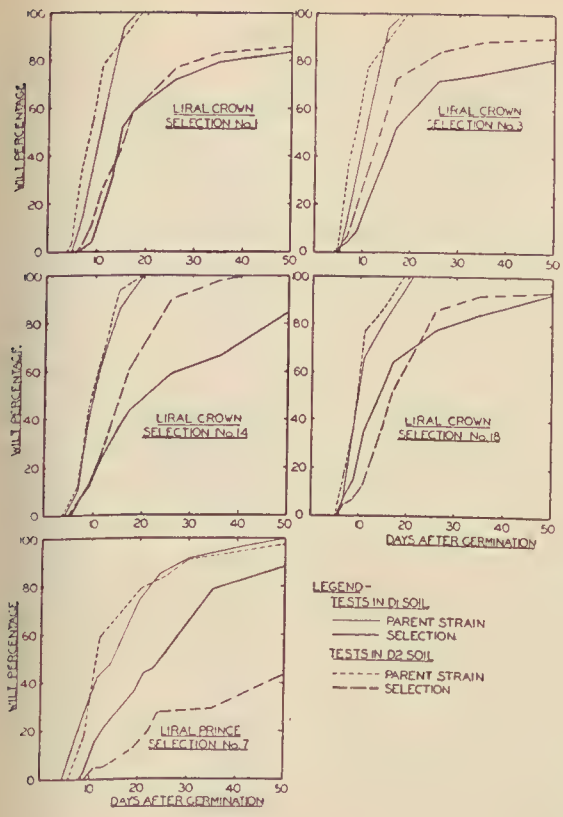


Fig. 11—Relative wilt development in selection and parent strains of Liral Crown and Liral Prince grown in naturally infected D1 and D2 soils respectively maintained at a constant temperature of 75° F.

therefore, that they have shown satisfactory field resistance to wilt only serves to further emphasize the warning of Jones et al (1926), which was cited above, regarding the interpretation of temperature tank tests.

(2) *Liral Prince.*

"Bird Cage" Tests.—During the winter of 1943 approximately 40 single plants were transplanted from the temperature tanks to "wilty" D1 soil in the "bird cage". However, before harvest, all except one plant (Selection No. 7) had succumbed to wilt.

All seed of this selection together with rows of the parent strain was re-sown in D1 soil during January, 1944, when soil temperatures very favorable for wilt occurred. The development of the disease is shown in Table 2. As with the first sowing of the Liral Crown Selections (see Table 1), a relatively high percentage of susceptible individuals (35·8 per cent.) was eliminated.

A further test was sown in the following winter. In this experiment no wilt occurred until 120 days after germination. Its subsequent development is indicated in Table 2.

To date Liral Prince Selection 7 has not been subjected to a second summer sowing.

The figures indicate that Liral Prince Selection 7 possesses considerable field resistance to the form of wilt disease in D1 soil. As in the tests with Liral Crown, it was found that, whereas the parent variety finally showed a high wilt percentage in both winter and summer sowings, the selection showed much greater resistance in the winter sowing which is the normal practice in Victoria.

Temperature Tank Tests.—The results of temperature tank tests of Liral Prince Selection 7 in both D1 and D2 soils are shown in Fig. 11. The curves shown represent the average results from three separate tests. In these tests, the rate of wilt development in D2 soil was consistently slower than in D1 soil. By contrast,

Table 2.—Results of Tests of the Wilt Resistance of Liral Prince Selection Grown in Naturally Infected Drouin (D1) Soil in the "Bird Cage" at Burnley.

| Strain. | Summer Sowing, Germinated 22nd January, 1944. | | | Winter Sowing, Germinated 5th June, 1944. | | |
|---|---|---|---|---|---|---|
| | Wilted Plants After— | | | | | |
| | 10 Days. | 30 Days. | 60 Days. | 120 Days. | 130 Days. | 150 Days. |
| | % | % | % | % | % | % |
| Liral Prince Parent Strain .. .. | 36·6 | 96·4 | 100 | 1·2 | 28·7 | 98·7 |
| Liral Prince Selection 7 .. .. .. | 6·6 | 27·6 | 35·8 | 0·0 | 0·0 | 0·0 |

no difference occurred in the rate of wilt development in the Liral Prince controls grown in the same pots.

### *Experiments with Strains of Fusarium Lini*

It is known that *F. lini* exhibits the phenomenon of physiologic specialization. Broadfoot and Stakman (1926) distinguished eight different strains of *F. lini* by their parasitic action on four varieties of flax. The number of strains was later increased by Broadfoot (1926) to at least nine. Letcher and Willaman (1926) studied the alcohol production of Broadfoot and Stakman's eight strains and found that the two forms which were least virulent in their attack on the host plant produced least alcohol, indicating a correlation.

In America, certain flax varieties which were released as resistant to wilt, subsequently became less resistant. Dillman (1936) suggested that this phenomenon was due to the existence of different physiologic forms of *F. lini*. More recent studies by Borlaug and Christensen (1941) have confirmed this view. They have shown that isolates of *F. lini* obtained from many regions in the United States and Canada comprise numerous races, some of which differ widely in pathogenicity on flax varieties. The introduction or development of new physiologic races of the pathogen had resulted in the breakdown of resistance of some varieties such as Chippewa and Winona, which were originally released as resistant to *F. lini* (Barker 1923).

Schuster (1944) investigated the reactions of Bison and Punjab varieties to *F. lini* races 6 and 11 respectively. Bison is susceptible to race 6 and resistant to race 11, whereas Punjab is susceptible to both. It was found that Bison does not exclude the pathogen, but confines the less virulent race 11 to the host root and crown tissues, and delays the development of the more virulent race 6 for several days. No such limitation or delay occurred in the susceptible Punjab variety.

The comparative mortality response of two flax varieties in two different flax "sick" soils has been studied by Vanterpool (1944), who found that whereas the susceptible Crown variety developed a much higher percentage of wilt in Saskatoon soil than in Ottawa soil, the reverse was true in the case of the moderately resistant variety Royal. Such a result could be attributed to the existence of different physiologic races of *F. lini* in the two soils.

The results of the varietal resistance and selection experiments described above have indicated that it is possible to distinguish two strains of the wilt fungus in Victoria by the reactions of certain varieties and selections. These have been termed the D1 and D2 forms of *F. lini* respectively.

The results of the varietal resistance experiments conducted in the Burnley temperature tanks have also shown that certain varieties such as Bison, Buda, Redwing, Rio, &c., which are reported resistant to the disease in America, Dillman (1936) (1941), may develop a high percentage of wilt when grown in naturally infected Drouin soils maintained at 75° F. The English wilt-resistant variety, Norfolk Queen, has also proved to be susceptible under the conditions of the Burnley tests. It is recognized that the degree of wilt development in the Burnley tests is much greater than in the same variety grown under field conditions. This has been the experience in Victoria, particularly with winter sowings, where the plants have been subjected to sub-critical temperatures for several months after germination. Dillman (1936) has stated that although the Bison variety is practically wilt free at moderate temperatures, it wilts somewhat at high summer temperatures.

In the temperature tank tests, the variety Cawnpore 483 proved to be resistant. This variety has been reported to be susceptible in Argentine (Kugler and Remussi, 1939).

These differences in wilt reactions strongly suggested that the Victorian strains of *F. lini* are different to those which occur in other countries. Comparative tests were therefore made of the reactions of different varieties to one of the Drouin strains (D1) and to three strains from overseas as under:—

*F. lini* F1, New Zealand;
*F. lini* F12, New Zealand;
*F. lini*, Minnesota.

The New Zealand fungi were obtained from Dr. Bayliss, and the Minnesota strain from Dr. Waterhouse, Sydney University, who received it originally from Dr. J. J. Christensen of Minnesota. The identity of this last named strain is unknown. More recently, Dr. Christensen has kindly supplied the writer with certain of his numbered strains of *F. lini*. It is intended to make further tests with these against the Victorian forms.

### *Method*

Mycelial mats of the respective strains of *F. lini* were produced on Czapek's nutrient solution. After filtering and washing, these

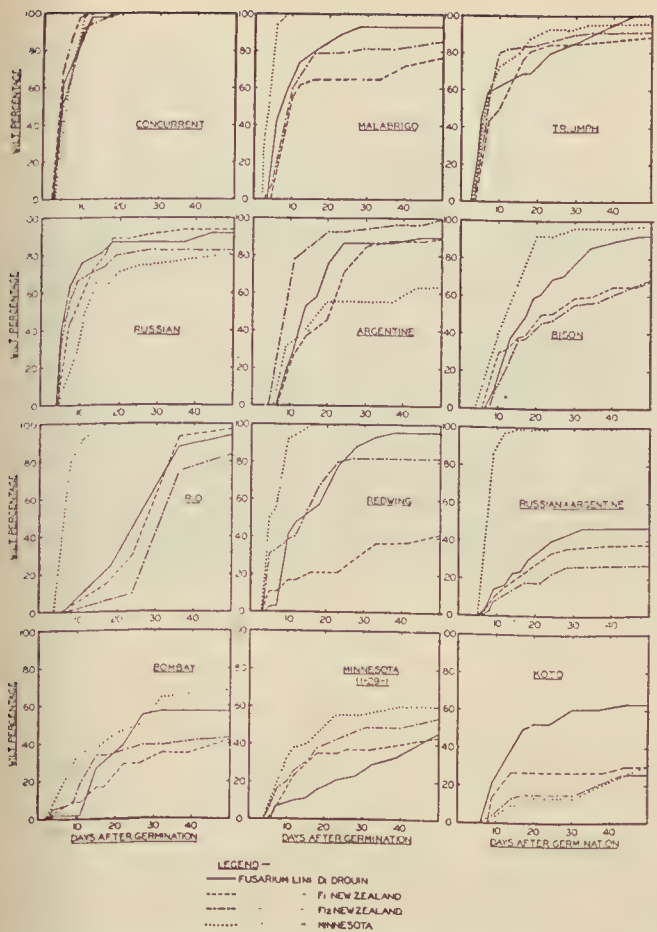


Fig. 12—Showing wilt reactions of different flax varieties grown in sterilized soil inoculated separately with four strains of Fusarium lini and maintained at a constant temperature of 75° F.

were added to the top 3 inches of pots of steam sterilized soil, which were then placed in temperature tanks maintained at a constant temperature of 75° F.

The wilt infection of the soil was increased by two sowings of the susceptible Concurrent variety. One sowing was made immediately after inoculation of the soil and the other about three weeks later. Very satisfactory wilt development was produced in all pots by this means.

The surface of each pot was then divided by small sticks into equal areas (two in the first experiment and four in subsequent tests). In one of these sections in all pots a control sowing of the susceptible Concurrent variety was made, and the remaining sections were sown with the varieties under test.

The numbers of plants germinating in each section was recorded. After the appearance of wilt disease (which usually occurred about four days after germination), infected plants were counted and removed at frequent intervals and the wilt percentages, based on the germination counts, were determined. From this data, the curves shown in Figs. 12 and 14 were drawn. The tests were concluded 50 days after germination.

## *Results*

The results obtained with selected varieties are shown in Fig. 12.

It was found that the four strains of *F. lini* tested differ widely in their pathogenicity to certain flax varieties. By contrast, the reactions of other varieties such as Concurrent, Triumph and Cawnpore 483 showed no differences between strains.

In general, *F. lini* Minnesota proved much more virulent than the other strains of the pathogen on all varieties, with the notable exceptions of Argentine and Koto.

The differences between the four races of *F. lini* was further demonstrated in a test of their pathogenicity to strains of Liral Crown and J.W.S. flax varieties selected for resistance to *F. lini* D1.

The results presented in Fig. 14 show that whereas the parent strains of these varieties show little if any differences in reaction to the four races of *F. lini*, there are wide differences in the case of the selections. Under the conditions of this experiment, each selection exhibits an increase in resistance to *F. lini* D1 (Drouin) and *F. lini* F1 (New Zealand) (the pathogenicity of these two races appears to be identical in this instance), whereas Liral Crown Selection 1 shows no increase in resistance to either *F. lini* F12 New Zealand or *F. lini* Minnesota, and the J.W.S. selection shows resistance to *F. lini* F12 New Zealand, but no resistance to *F. lini* Minnesota.

It is concluded from the above results that *F. lini* D1 is distinct from the three overseas races tested. The need for testing new flax varieties to as many races of *F. lini* as possible before release is clearly demonstrated by these experiments.

Fig. 13—Reactions of Rio and Concurrent varieties to four strains of Fusarium lini in soil maintained at 75° F. Photographed 30 days after germination. At the end of 50 days Rio was severely wilted in all pots.

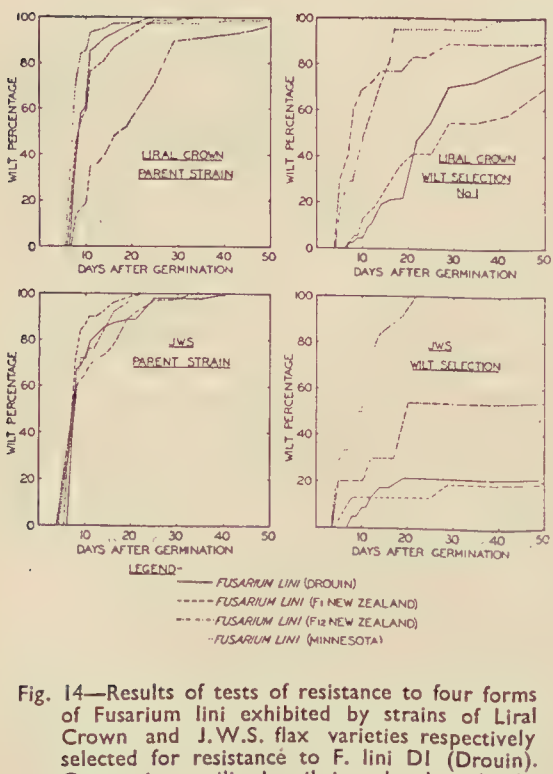


Fig. 14—Results of tests of resistance to four forms of Fusarium lini exhibited by strains of Liral Crown and J.W.S. flax varieties respectively selected for resistance to F. lini DI (Drouin). Grown in sterilized soil inoculated with the four forms of F. lini separately and maintained at a constant temperature of 75° F.


## *Summary.*

Severe wilt has occurred in flax grown in the Drouin district of Victoria on land which had been over-cropped with flax. The disease does not become apparent till October or later.

The fungus associated with the wilted plants has been identified as *Fusarium oxysporum* (Schlecht), *F. lini* (Bolley), Snyder and Hansen (= *F. lini*).

The symptoms of the disease are described.

The effect of soil temperature on the development of flax wilt has been studied. The minimum temperature was found to be approximately 55° F., and the disease is favoured by an increase in temperature up to 75° F. Susceptible plants growing in naturally infected soil escaped the disease in their early stages if the soil temperatures are below 55° F., but such plants invariably became wilted if the soil temperature was increased to 75° F., at any time up to at least twenty weeks after germination.

In the field the occurrence of wilt in susceptible flax plants growing in naturally infected soil is dependent solely on the prevailing soil temperatures. In general, these are unfavorable for the disease under Victorian conditions from May to September inclusive.

The wilt reactions of numerous flax varieties grown in two naturally infected soils, maintained at a constant temperature of 75° F., have been

studied. It is recognized that the risk of wilt infection in such tests is very much greater than under normal fluctuating temperature conditions in the field. In spite of this, several varieties showed a high degree of resistance.

While the great majority of varieties exhibited similar wilt reactions in the two soils, there were several in which different reactions were recorded. This result strongly suggests that a distinct strain of *F. lini* occurred in each soil.

Wilt resistant strains of Liral Crown, Liral Prince, Royal and J.W.S. have been selected in the temperature tanks. These strains have shown a superior wilt reaction to the parent varieties in temperature tank tests (the Royal Selection in particular). The Liral Crown selections have also proved highly resistant in both winter and summer sowings, in naturally infected soil in the field. The Liral Prince selection has also proved highly resistant in a winter sowing in the field

One Victorian strain of the wilt fungus (*F. lini* D1) has been compared with two strains from New Zealand and one from Minnesota in temperature tank tests. From the results of these, it is concluded that *F. lini* D1 is distinct from the three overseas forms tested. The need for testing new flax varieties to as many races of *F. lini* as possible before release is clearly demonstrated by these experiments.

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# Certified Pullorum Tested Flocks

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942, issue of the *Journal of Agriculture*.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

| Owner. | Number of Birds. |
|---|---|
| Abernethy, F. J., Box 108, Horsham | 577 |
| Abikhair, L., 41 Wilfred-road, Ivanhoe | 45 |
| Andrew, C. S., Longlands-road, Mitcham | 128 |
| Ashgrove Stud Poultry Farm, Cockatoo | 1,795 |
| Baldwin, J. H., Wattle Glen | 292 |
| Bantick, K., Old Dandenong-road, Heatherton | 411 |
| Barastoc Experimental Farm, Central-avenue, Bayswater | 327 |
| Barlow, M., Everest-crescent, Olinda | 58 |
| Barnes, Mrs. A., The Heights Poultry Farm, Blackburn-road, Blackburn | 2,763 |
| Bartholomew, G., Canterbury-street, St. Arnaud | 144 |
| Bartlett, N. M., Box 5, Pimpinio | 325 |
| Bassett, R. A., South Muckleford | 171 |
| Batey, L. J., Katandra West | 784 |
| Batey, R. V., Katandra North, via Yabba North | 878 |
| Batten, F. H., Central-avenue, Bayswater | 766 |
| Becker, F. W., Follett-road, Cheltenham | 326 |
| Beer, Mrs. E. V., "Rainbow Lodge," Kyneton | 151 |
| Bilton, H. A., St. Arnaud East | 177 |
| Bray, J., 18 Hotham-street, Warrnambool | 98 |
| Buchanan, R. O., Diamond Creek | 1,090 |
| Butler, J. E., Nathalia | 660 |
| Cakebread, H., Shady Creek, via Buln Buln | 200 |
| Cannings, P. G., Shepparton East | 1,261 |
| Chapman, Mrs. E. E., Youanmite | 349 |
| Charnley, Harry, South Morang | 62 |
| Christie, R. R., and Son, Bentleigh | 829 |
| Clegg, R. M., 52 Burns-street, Hamilton | 69 |
| Coats, C. J., Box 34, Donald | 203 |
| Coleman, A. J., Mountain-highway, Bayswater | 50 |
| Messrs. Corbett Bros., Torbay-street, Macleod | 1,317 |
| Cornish, J. T., Healesville | 283 |
| Counsell, A. J., Koomba-road, Wantirna | 484 |
| Coupar, J. E., Box 18, Nathalia | 519 |
| Crowle, L. Z., "Monomeith," Broadford | 241 |
| Davey, A. R., Sellars-street, Greensborough | 626 |
| Davidson, Mrs. A., Sherbrooke-avenue, Ringwood | 107 |
| Davies, L. F., Westall-road, Springvale | 395 |
| Dawson, R. G., Maldon-road, Castlemaine | 948 |
| Dent, A. T., Sellars-street, Greensborough | 646 |
| Dibbs, H., 3 Balfe-crescent, West Brunswick | 145 |
| Dimoline, W., and Son, Messrs., Heatherton-road, Noble Park | 450 |
| Dookie Agricultural College, Dookie | 399 |
| Eastaugh, T. L., Point Nepean-road, Highett, S.21 | 616 |
| Elson, H., "Osborne," Mornington | 110 |
| Emmott, J. T., Inglewood | 445 |
| Evans, Geo. R., 10 Mill-street, St. Arnaud | 177 |
| Eyres, L., Main Ridge | 295 |
| Fellows, J., Outhwaite-road, West Heidelberg | 521 |
| Fletcher, J., Yallamba Poultry Farm, Clarkes-road, Yarrambat | 206 |
| Francombe, Mrs. M., "Kathwal," Princes Highway, Dandenong | 35 |
| Messrs. Gedye Bros., Blackburn Poultry Farm, Blackburn | 3,245 |
| Gair, W. L., Bayswater | 136 |
| Gillespie, C., Britannia Creek-road, Wesburn | 194 |
| Giovanetti, Mrs. G. E., Skene-street, Kennington, Bendigo | 185 |
| Gough, L., 6 Clive-street, East Brighton | 173 |
| Graham, C., "All Black Poultry Farm," Portarlington | 58 |
| Grant, D., 6 Laurel-grove, Blackburn | 102 |
| Greenshields, E. J., Lancefield | 669 |
| Grenville, G. W., Grenville Stud Poultry Farm, Springvale | 2,873 |
| Gwyther, R. P., "Woorayl," Highton, Geelong | 621 |
| Hall, R. H., Wal Wal | 840 |
| Hall, W. S., Cairns-road, Hampton Park, via Dandenong | 199 |
| Hamilton, A., "Lyncroft," Flinders | 485 |
| Hansen, Mrs. M. A., Katandra West | 88 |
| Harrington, W., 179 Woodward-road, Golden Square | 1,005 |
| Harrison, Mrs. A., Shenfield-street, Cobden | 151 |
| Hayes, R., Mt. Dandenong-road, Montrose | 183 |
| Hearse, G. E., Narre Warren North | 96 |
| Hemphill, A. E., "Glenara" Poultry Farm, Monegetta | 521 |
| Henderson, C. W., Shepparton East | 580 |
| Henderson, Wm. R., 22 Chesterville-road, Cheltenham | 57 |
| Hewett, A. T., Central-avenue, Bayswater | 472 |
| Hewitson and Phelan, Messrs., "Golf House," Healesville | 122 |
| Hill, A. E., Terrara-road, Vermont | 391 |
| Hipwell, Mrs. M. C., Maffra | 391 |
| Hobson, F. L., Oakleigh-road, Lower Ferntree Gully | 20 |
| Hollingshead, R. F., "Quarrydene", Montrose | 810 |
| Hollis, C., Donald | 209 |
| Howard, A. P., Blackhill-road, Kyneton | 306 |
| Huckle, W. H., Waverley-road, Glen Waverley | 174 |
| Hughes, Mrs. M. E., Mountain-highway, Bayswater | 124 |
| Humphrey, A. J., 355 Highbury-road, Burwood | 253 |
| Hunt, R. R., 365 Highbury-road, Burwood, E.13 | 1,008 |
| Ikin, E. J., 44 Mackay-street, Seddon, W.13 | 64 |
| Iredale, W. H., 197 Point Nepean-road, Seaford | 37 |
| Jacobsen, W. R., "Sutton Park", Hull-road, Croydon | 82 |
| Jenkins, A. E., "Pen-Y-Bryn", Ridge-road, Kallista | 320 |
| Jolly, W., c/o Five Ways P.O., via Cranbourne | 252 |
| Jones, M. A., Heatherdale-road, Ringwood | 401 |
| Kell, A. W., 6 Mill-street, St. Arnaud | 133 |
| Kidgell, L. L., 34 Mullum-road, Ringwood | 336 |
| Kosch, E. W., Coromby | 417 |
| Lang, J., 46 Dundas-street, Thornbury | 54 |
| Lawrie, Mrs. M. J., 107 Albert-street, Sebastopol, Ballarat | 430 |
| Le Deux., F. J., Angustown, via Nagambie | 244 |
| Longerenong Agricultural College, Dooen | 448 |
| Lowe, G., Blackwood Dell, Lillico | 92 |
| Lowe, L. S., "Callemondah", Central-avenue, Bayswater | 418 |
| Lucas, G., 4 Downing-street, Blackburn | 1,105 |
| MacLean, C. C., Kelvinside-road, Noble Park | 69 |
| McCausland, W., Boronia-road, Boronia | 48 |
| McDonald and Ellen, Avoca | 640 |
| McDonald, J., 43 Bloomfield-avenue, Maribyrnong | 164 |
| McDonald, R. A., "Barton", Moyston | 189 |
| McLean, J. F., Follett-road, Cheltenham | 293 |
| McNeil, W. G., Hillcrest-avenue, Eltham | 364 |
| Maher, Allan E., "Alandale," Wal Wal | 970 |
| Major, W. R., Girgarre | 221 |
| Mayne, N., Brandy Creek-road, Warragul | 89 |
| Mead, J. L., 28 Golf Links-avenue, Oakleigh | 186 |
| Meaklim, R., Drumnell Park, Mooroopna | 80 |
| Meier, C. G., "Bylands," Sydney-road, Kilmore | 300 |
| Messenger, C., 240 Rathmines-street, Fairfield | 180 |
| Micell, M., Monbulk Post Office | 120 |
| Michell, R., Greensborough-road, McLeod | 576 |
| Molson, W. E., 188 Surrey-road, North Blackburn | 727 |
| Mooney, D., Yarra Junction | 260 |
| Moore, H. A., Warrandyte-road, Ringwood North | 900 |
| Moroney, J. B., High-street, Kangaroo Flat | 1,808 |
| Mumford, L. J., Steele-street, Healesville | 400 |
| Nankervis, H. A., Lilydale | 508 |
| Nemet, P., Springvale-road, Springvale South | 1,295 |
| Nichols, Mrs. E. M., "All Red" Poultry Farm, Yan Yean | 732 |
| Orange, Mrs. C., "Lakewood," Marong | 234 |
| O'Shea, J. M., Avoca | 94 |
| Paton, W. S., Rokeby Farm, Glenburnie-road, Mitcham | 114 |
| Peel, C. W., "Callemondah," Gnarwarre | 261 |
| Petrie, R. W., Box 25, St. Arnaud | 181 |
| Poole, A., Hull-road, Mooroolbark | 321 |
| Pooley, F., Canterbury-road, Blackburn | 241 |
| Porter, J., Sherbourne-road, Montmorency | 284 |
| Poulton, A. W., Vickers-street, Sebastopol | 1,537 |
| Rae, J., 277 Albert-street, Sebastopol, Ballarat | 2,272 |
| Ralph, W. R., Commercial-road, Lower Ferntree Gully | 107 |
| Ridgway, Geo., Callander-road, Noble Park | 196 |
| Robinson, J. L., Langwarrin | 167 |
| Robson, F., 16 Nelson-street, North Wonthaggi | 25 |
| Rouse, H. E., James-street, Box Hill | 86 |
| Salmond, J. B., Deer Park | 153 |
| San Miguel, Mrs. M. H., Woodhouse-grove, Box Hill | 2,361 |
| Schulze, Mrs. C. A., Box 52, Dimboola | 98 |
| Secar, W. T., Station-road, Wesburn | 89 |
| Shelford, D., Beaufort-road, Croydon | 141 |
| Shipp, R., P. B., Kerang | 511 |
| Simmons, J. T., 6 Lindsay-avenue, Murrumbeena, S.E.9 | 24 |



[*Continued on page 364.*

# CITRUS MARMALADES

By RUTH BROMFIELD, Fruit Preserving Expert

For many people breakfast is incomplete without marmalade. That in itself is a sufficiently good reason why the housewife should know how to make the best marmalades or how to make an acceptable marmalade when the more suitable citrus fruits are in short supply. Marmalades are a useful source of Vitamin C, now so well known as a virtue of black currants also, facts which proved of some importance to the dieticians responsible for England's wartime feeding.

THE most favoured citrus fruits for marmalade are the bitter oranges—Poorman and Seville—and grapefruit, but there are many combinations which make an acceptable marmalade when the others are in short supply.

Sweet oranges—Navel and Valencia—and lemons make mildly flavoured marmalades, but the appearance is not quite so good, as the pith of these fruits does not boil clear. Shaddocks and limes also may be utilized.

The principles of marmalade-making are essentially the same as those of jam-making, except that the thick peel of citrus fruit requires a longer time to cook than the soft fruits from which jam is made. Also more water has to be added to cook the peel, and boiling has to be continued usually for two hours before the sugar is added.

A characteristic of citrus fruits is that most of the jellying material (pectin) is to be found in the white inner skin (pith). When the fruit is being cut up, the housewife who likes very little pith in the marmalade can cut the peel as finely as she cares to, but instead of discarding the pith, she should cut it up roughly, tie it loosely in a muslin bag and cook it with the marmalade until just before the sugar is added.

In other respects the rules for jam-making apply to marmalade-making. Prolonged boiling after the sugar has been added should be avoided, for it not only spoils the flavour and darkens the colour, but also affects the pectin in the fruit, causing loss of jellying properties. As with jam, the presence of acid is essential in order to bring the pectin into solution and to prevent crystallization.

## *Points in making Marmalade*

*Washing the Fruit.*—The fruit should be well washed in clean water and, if necessary, scrubbed, or the marmalade will be cloudy.

*Cutting up the Fruit.*—As stated previously, much of the pectin is located in the skin of citrus fruit, and it must be brought into solution before a jellied marmalade can be made. The fineness of the shreds of peel is largely a matter of choice, but it is clear that the more thinly the peel is cut, the more readily will the pectin be brought into solution.

*Soaking the Fruit.*—A large amount of water is added to the fruit to allow for evaporation during the long cooking. Soaking the peel in water helps to soften it, but this is not essential and the marmalade may be made in the one day. If boiling water is poured over the peel, the soaking period is considerably reduced.

*Addition of Acid* is necessary so that the acid, pectin, and sugar will be in the right proportion for a good gel. The required acidity is obtained usually by the addition of lemons.

*Boiling the Pulp and the Sugar.*—As in jam-making, the major part of the cooking should be carried out before the sugar is added. The preliminary cooking usually takes about two hours, during which time the pulp should be considerably reduced and the peel softened so that it will disintegrate when squeezed between the fingers. If the reduction of the pulp is carried out before the addition of the sugar, the time of boiling should not take longer than 20 to 30 minutes. In this way a marmalade of good colour and flavour will be obtained.

### Testing for Setting Point.

*Flake Test.*—A wooden spoon is dipped into the marmalade, removed, and turned horizontally in the hand until the adhering marmalade is slightly cooled. The mixture is then allowed to drop from the edge, and, if it has been boiled sufficiently, the drops will run together forming flakes which break off in a

clean, sharp manner. This test should be made when tiny bubbles appear all over the surface of the marmalade and it begins to rise in the pan. If the test is not wholly satisfactory, do not prolong boiling longer than 40 minutes after adding sugar, otherwise the marmalade will be spoilt.

Alternatively, the marmalade may be removed from the fire when a thermometer dipped in the mixture reaches 222°F. If the flake test, which should be used in conjunction with the temperature test, gives a negative result at this stage, no amount of additional boiling will cause the marmalade to set.

### Transferring the Marmalade to Jars.

As soon as the marmalade has reached setting point it should be skimmed. Delay in removing the scum causes it to cling to the peel. To prevent the peel from rising in the jars, the marmalade should be allowed to cool in the pan until a thin skin begins to form, then stirred gently and poured into the jars.

The jars are then sealed, either with cellophane or paraffin as soon as the marmalade is cold.

### The General Method of Making Marmalade.

(1) Thoroughly clean and weigh the fruit.

(2) Halve each orange and remove centre core as this does not boil clear and spoils the appearance of the marmalade. Then quarter the fruit and remove the pulp as a dry skin is much easier to shred than the whole orange. When the pith is very thick, trim it down till the sliced peel is about ¼ inch in thickness. Shred the peel as finely as possible and allow to soak in some of the water overnight. Cut the pith up roughly or put through the mincer and soak with the sliced pulp in the remainder of the water.

The amount of water allowed is 1 quart to 1 lb. of bitter fruit—Poorman and Seville oranges, cumquats, grapefruit, lemons, shaddocks, limes, and 1 pint to each pound of sweet orange—Navel or Valencia; therefore it is obvious that there will be a greater yield if the sweet oranges are combined with lemons or some other bitter fruit.

(3) Next day simmer the peel from 1½ to 2 hours until it is tender. Add lemon juice (2 lemons to 3 lb. of fruit) to the rest of the fruit and simmer in a closed pan for the same length of time and then strain through a colander, discarding the pulp and retaining the liquid.

To secure a larger yield of marmalade, the sliced pulp may be added to the peel when it is put on to cook and the cut up pith which has been soaking separately may be put in a piece of muslin and simmered with the peel and removed just before the sugar is added. All juice should be squeezed from the bag.

(4) Measure the total amount of liquid and peel and return to the pan with an equal measure of sugar.

(5) Stir till the sugar is dissolved, then boil rapidly till it will respond to the setting test. Do not boil longer than 40 minutes.

(6) Remove scum, cool slightly, bottle and seal when cold.

## CERTIFIED PULLORUM TESTED FLOCKS—*continued from page 362.*

| Owner. | Number of Birds. |
|---|---|
| Simpson, G. D., Greenways Poultry Farm, May-road, Glen Waverley | 2,772 |
| Smith and Edwards, 61 McPherson-street, Horsham | 34 |
| Smith, E., Valley-road, Highton, Geelong | 1,285 |
| Smith, H. A., Marong-road, Malden Gully | 374 |
| Stant, W. J. and F. E., Westall-road, Springvale | 1,505 |
| Stewart, J. A., Maldon-road, Castlemaine | 770 |
| Stewart, P. D., Bayswater-road, Croydon | 98 |
| Stiles Bros., "Fair View," Wallan | 1,091 |
| Sullivan, T., Biggs-road, Coburg, N.14 | 290 |
| Sutherland, J. M., Fulton-road, Box Hill | 927 |
| Sweeney, J. J., Tarara Stud Poultry Farm, Ararat | 788 |
| Swift, D. A., Kangaroo Flat | 853 |
| Taylor, H. R., 119 Rathgown-road, Reservoir, N.19 | 248 |
| Throup, N. C., Neerim South | 149 |
| Throup, R. E., Neerim South | 328 |
| Travaglia Bros., Canterbury-street, St. Arnaud | 883 |
| Trinca, M., Valley-street, East Oakleigh | 1,198 |
| Triplett, C. A., Muskerry, via Goornong | 280 |
| Uren, B. W., Taroona Farm, Lawrence-road, Mt. Waverley | 571 |
| Waldmann, F., Greythorne-road, North Balwyn | 936 |
| Wanliss, W. J., Springvale-road, Springvale South | 969 |
| Wardlaw, A. E., Avoca | 128 |
| Waugh, A. J., Helms-road, Kangaroo Flat | 970 |
| Webb, A. E. H., Frankston-road, Cranbourne | 3,854 |
| Wesley, J. H., Jnr., "Fairview", Kangaroo Flat | 846 |
| Weston, W. J., 104 Broom-crescent, Wonthaggi | 33 |
| Wheeler, F. R., Ararat | 71 |
| Whittington, S., 797 Bell-street, Preston | 93 |
| Williams, V. H., 91 Tone-road, Wangaratta | 708 |
| Winter, G., "Denehurst," Murgheboluc | 297 |
| Wohlers, S., Box 17, Jung | 314 |
| Wooster, G., Yallambie-road, Watsonia | 237 |
| Wright, A., Congupna Township, via Tallygaroopna | 464 |
| Wyld, Miss M. L., Regent-street, West Moolap, via Geelong | 43 |
| Yates, W., 64 Banks-street east, Ascot Vale | 30 |
| Youl, R. S., "Wycherley," Wedderburn | 1,254 |

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*Issued by direction of the Hon. N. A. Martin, M.L.A., Minister of Agriculture.*


## SUBSCRIPTION RATES

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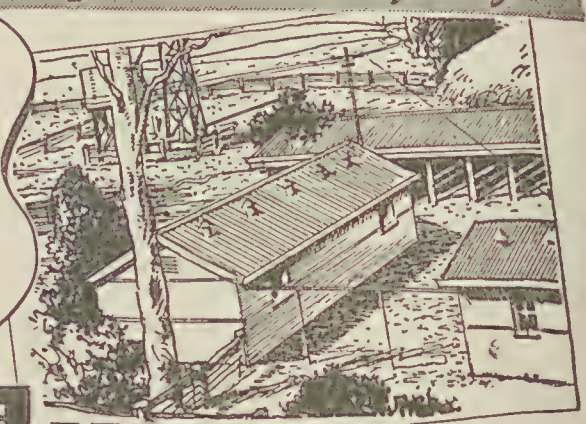

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# HAY AND SILAGE MAKING

## The Coming Harvest

By A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

THE need for ample reserves of fodder had never been greater than during the past season when one of the most serious droughts in Victorian history prevailed. Practically every farmer's reserves were exhausted before the winter and losses of stock, particularly dairy cattle have been severe.

A well-improved farm of the present day carries a considerably greater number of stock than the same farm a generation ago. This is largely due to the establishment of permanent pastures, subdivision of large paddocks, setting aside reserves of fodder from the excess growth of spring, and the adoption generally of modern improved farming methods.

Stock carried nowadays, in addition to being in greater numbers per acre, are for the most part heavier producers and require a constant supply of food throughout the whole year to hold them in condition and for normal growth. For milk production and fattening the food supply must be greatly increased. This necessitates the maintenance of a regular, ample supply of foodstuffs in all seasons. Such fodder supplies may be acquired most economically by conserving fodder from the farm itself, rather than the expensive practice of buying it in.

In any fodder conservation programme surplus pasture growth must receive first consideration, because it is produced without any special effort or outlay of expenditure as the result of normal farming practices, and will be wasted if not conserved as hay or silage. Hay and silage made from surplus pasture growth can be valued at the cost of conservation, and become the cheapest of conserved fodders available, and also are among the most nutritious.

Pasture supplies the bulk of food for cattle and sheep, and without it dairying, beef production, fat-lamb raising, and wool growing would be unprofitable. Pasture growth is seasonal and, therefore, does not supply a sufficiency of nutritious fodder continuously throughout the whole year. In southern and eastern Victoria, the pastures carry an abundance of good quality feed during the spring, but this dries off and loses quality during the summer. By autumn, feed is usually scarce, although seasonal rains start a fresh slow growth which, unless frost-bitten, continues until the spring. This green bite during the winter is inadequate for the stock. In the north-west, the late autumn, winter, and early spring may be the

best seasons, because lack of moisture is the chief limiting factor to growth.

On improved pastures, the luscious spring growth may be fifty times greater than winter growth, while in the dry months there is usually no growth at all.

Top—The "Cutlift" mows the pasture and loads the bogie.
Right—Changing one of the three bogies used for continuous working.

With irrigation, the good grazing period is lengthened from early spring until late autumn, but even then the aims of dairy, beef, and sheep farmers who require a constant feed supply are not achieved. In fact, the need for fodder reserves is greater because one advantage of

Upper—Unloading the bogie at silage pit.
Right—A silage pit almost full.
Below—A pit of silage in use.

irrigation is to have produce and fat stock out of season, when prices are usually high.

Surplus spring growth left standing in the paddock is inadequate, because it is either leeched of nutrients or rotten when required. Too much old dry feed also may retard autumn growth.

A home-made sweep.

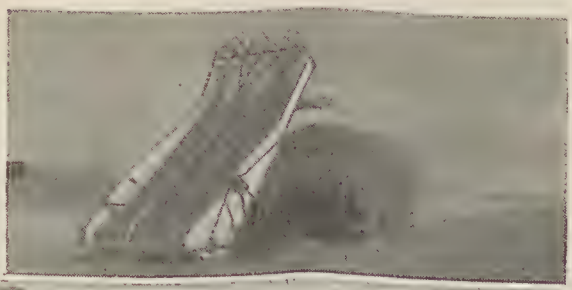
Sweeping hay to press.

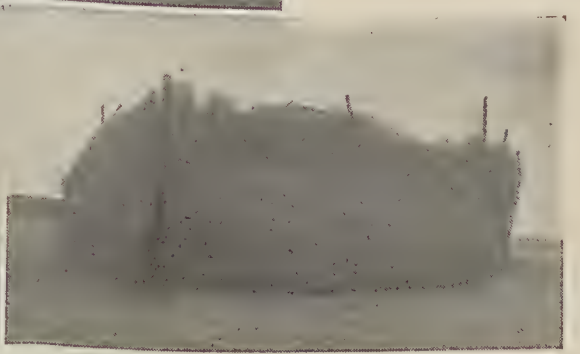
Pressing hay on a Kergunyah farm.

It is good farming, therefore, to conserve the surplus spring growth as hay or silage, and feed it when required.

The quantity of fodder to conserve depends largely on local seasonal conditions, but the aim should be to make 2 tons of hay or 5 to 8 tons of silage for each dairy cow each year, half this amount for each beef animal, or 2 cwt. of hay or 5 to 8 cwt. of silage for each sheep. These quantities normally would be in excess of requirements, but a reserve would accumulate for drought years when there would be no surplus fodder to conserve. In drought years, any hay in excess of requirements can be sold at remunerative prices to less provident stock owners.

Hay and silage both have a place in modern farming practice, but hay is by far the more common method of conservation. Hay has advantages in that it requires much less labour to make and later to feed out, and it can be readily transported and marketed. Silage is very heavy to handle. Nearly four times the weight of silage has to be handled to supply the same quantity of nutrients as a given quantity of hay. On the other hand, silage has some advantages in that weed growth and crops like maize or sorghums, which do not make good hay, can be conserved in this way and also that it is affected less by wet weather during harvest, and is fireproof.





Top—A hay loader at work.

Left—Making chaff silage.

Right—A 300-ton chaff-silage stack

A power take-off driven mower cutting lucerne preparatory to side-raking and baling.

easier to cure on account of longer and warmer days.

A longer harvesting season is obtained if silage is made early, and hay as soon as the pasture is ready. Where both silage and hay are made, silage-making should cease immediately conditions are ready for haymaking, otherwise the hay will be spoilt by cutting the pasture when over-mature. In the absence of elaborate machinery, more nutrients can be conserved as hay than as silage, and with hay a very large area can be cut and raked within a few days of when the pasture is ready. It does not have to be carted immediately it is cut. *Much grass is cut far too late, and a coarse, unpalatable product of low food value is obtained.* This type of hay, however, is better than insufficient hay, and a considerable proportion may be produced during this and other seasons when labour is scarce, and when the harvesting period is prolonged.

With grass hay, the grass and clover seeds usually mature and those which are not eaten and digested by the stock have a value in regenerating the pasture. All kinds of silage are free from the ravages of rats and mice. Pasture hay is rarely attacked either.

Well-made hay and silage are equally nutritious, and the losses of nutrients during conservation are about the same with each product.

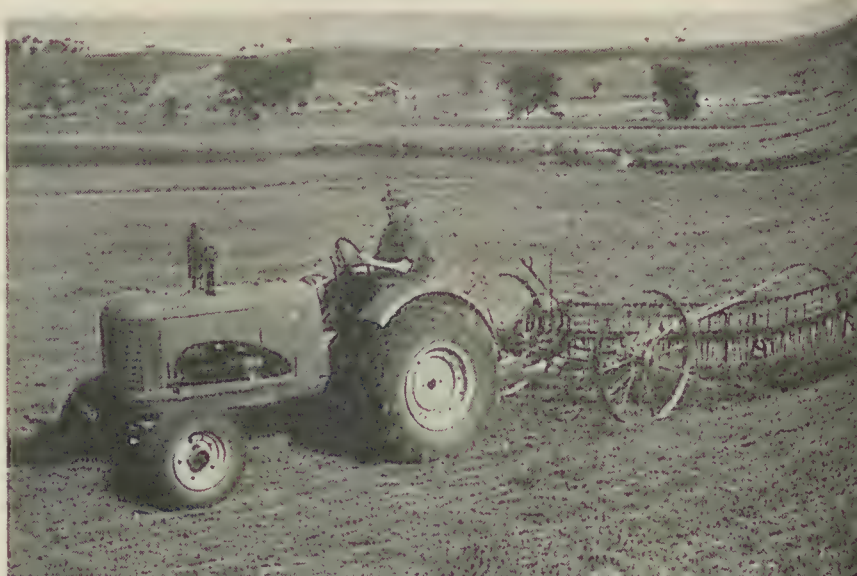
There is little difference between the most favorable time to cut pasture for hay or for silage. The best products are obtained from pasture cut just as the pollen sacs or anthers emerge from the flowers of the principal grass species present.

Pasture may be cut slightly earlier or later for both products, but in practice the tendency is to cut a little earlier for silage, and later for hay. A better aftermath is obtained, and it is possible to make better quality hay and silage from earlier cut pasture, but pasture cut later in the season is

### *Preparation for the Harvest*

It is desirable that hay sheds, stack-yards, silos, and silage pits should be tidied up in readiness for the new season's material. Any partly-used stacks should be cut in such a way

Side-delivery rake and tedder, raking lucerne into windrows.



that the exposed face will be vertical, with no benches left to allow rainwater to enter. Temporary fences around used stacks should be carefully rolled-up in readiness for the new stacks. Harvest-time is a busy period, and all preparations should be made now to avoid any possible delay when it does commence. All harness, mowers, rakes, sweeps, hoists, waggons, frames, presses, engines, forks, and other implements and machinery should be overhauled and put in repair well before operations are put in hand.

Engine-functioned pick-up baler, picking up lucerne from the windrow, feeding to the chamber and pressing in one continuous operation.

The paddocks to be cut should be selected so that they can be shut up as soon as the remaining paddocks are growing sufficient feed to carry the farm stock. The fences around the paddocks may require repairing to prevent stock breaking through, trampling the feed, or interfering with harvesting.

It is always a wise precaution to pick up all unused pieces of wire and place then where they cannot become a menace. Probably more breakdowns of machinery and other accidents are caused by wire lying about than by anything else.

Wherever possible, different paddocks should be cut each year. It may be necessary to vary this procedure this season, and cut the paddocks from which the greatest amount of fodder will be obtained with the labour available.

### *Harvesting Methods*

The way in which the pasture crop is harvested depends largely upon the machinery at the disposal of the farmer. The practices shown in the illustrations should require very little extra explanation. The use of the more elaborate plants, such as the "Cutlift", the automatic hay loaders, and the pick-up baler, are beyond the means of small farmers; but, when conditions become settled again, they should be more widely used by larger farmers and contractors.

With the "Cutlift" and five men—one tractor driver, one loading, two bogie drivers, and one unloading—25 tons of silage can be made in an average eight-hour day.

At "Blackwood" Station, Penshurst, up to 60 tons of chaffed silage have been made in one day with a team of sixteen men, a mower drawn by two horses, four motor trucks, two hay loaders, a blower and tractor. Without the blower up to 90 tons of pit silage can be made daily, but an additional mower, and two horses or a small tractor for unloading are required.

On smaller farms the most economical method of making pasture silage is to cut the grass with a mower and, with a good crop, sweep it direct to the pit. A light crop is often more easily handled by raking into windrows before sweeping.

Wherever possible the pit should be excavated out of soil which will not readily admit moisture. It should be on the side of a slope, so that it can be drained, and also to allow a dray to be backed in when the silage is being fed out. If the pit is well drained in this manner, it is not necessary to pile the pasturage much above ground level when making the silage. If the pit is simply a hole in the ground, the silage will have to be lifted out or a ramp made for backing in a cart.

The pit should be about 6 ft. deep, and the pasture should be piled up nearly 6 ft. above ground level, so that the silage will not be below ground level when it settles. This is necessary to shed the rainwater. If it is to be kept for more than a season, the silage should be covered with 1 ft. of earth, but if it is to be used the following season, the value of the silage, which deteriorates on top, will be less than the cost of putting on and later removing soil.

Stack silage is satisfactory when used the following season. A grab-lifter is desirable for making stack silage. Round stacks 12 to 16 ft.

in diameter are convenient sizes to build, and are large enough to avoid excess deterioration.

Under present conditions, the addition of molasses to improve silage is not economical.

The usual method of making pasture hay is to cut the pasture with a mower, rake within 24 hours into large windrows, and, as soon as cured, sweep direct to the stack or press. Large windrows protect the hay from light rain, heavy dews, and the bleaching action of the sun. Cocking is unnecessary unless it is impossible to stack or press the hay within a week from cutting. Cocks containing a sweep load of hay are preferable to smaller ones.

Hay is ready to cart when moisture cannot be squeezed out by twisting a small bunch in the hands. Hay stacked at this stage is tough and palatable, with little loss of clover leaves and other more nutritious portions.

After the pasture has been cut and raked into windrows and cured, it is possible to bale 2½ to 3 tons of hay per hour. A team of eight men—one sweeping with a tractor, three forking to feeder, one feeding, two tying the bales, and one stacking—is required.

Hay, if it is to be kept for any length of time, should be stacked on dry foundations under cover or else in large stacks, which are thatched or covered with tarpaulins. For such stacks a grab-lifter is desirable.

The grab-stacker in operation.

Hay to be fed the following season, and for which there is no shed accommodation, may be stacked by hand. Where the distance of sweeping is short, six men can stack up to 20 tons during a six-hour day between milkings. Three horse sweeps are necessary, each requiring one man. Two men working together lift the hay with forks on to the stack where the sixth man, the stack builder, awaits it. Such stacks are usually made about 10 ft. wide, and are usually taken to about 9 ft. at the eaves. Where neighbouring farmers co-operate it should be possible to get six men to form an efficient team for stacking. By using a tractor sweep, this work can be done by four men.

Drays and wagons may be used in place of sweeps, and are suitable for carting hay long distances where labour is available for the double handling, but the cost of carting pasture for silage on drays or wagons is prohibitive, unless lifting machinery or cheap labour is available for loading and unloading.

### *Size of Stacks and Pits*

The size of stack to build can be determined after estimating the quantity of hay in the field. It takes 350 to 600 cubic feet of loose pasture hay to weigh a ton in a freshly-built stack. A large freshly-built stack of good quality, loose hay will go about 350 cubic ft. to the ton. Stacks built on a rectangular base 10 ft. by 20 ft., and 9 ft. to the eaves with fairly vertical sides and steep tops to shed the rain, hold 6 to 8 tons of hay. If taken 12 ft. to the eaves they hold 9 to 12 tons of hay, and if taken 15 ft. to the eaves 13½ to 18 tons of hay. If the sides spread, more hay will be built into them. After twelve months the stacks will have settled, and then 300 to 400 cubic ft. of hay will weigh 1 ton.

Baled pasture hay also varies considerably with the dryness and quality of the hay, and the pressure used in baling. About 200 to 250 cubic ft. of good well-pressed hay weighs 1 ton.

When pick-up balers are used to bale direct from the windrow it is necessary to press the bales lightly at 250 cubic ft. to the ton. If pressed tightly the moisture content may be

sufficient to spoil the hay. Hay with 25 per cent. moisture may be loosely pressed or stacked loose. The dew on the windrows will increase the moisture content of the hay and, consequently, it is inadvisable to press direct from the windrow too early on a dewy morning.

After it has settled, about 40 cubic ft. of silage weighs 1 ton. Silage in a quickly-filled pit 6 ft. deep usually settles to about one-third of its original depth. A stack (or pit) 12 ft. high will usually settle to about half of its original height.

Making silage on Mr. M. F. Walker's property, Yinnar. The sweep is built on to a motor car which is driven in reverse to gather the pasture. It is then lifted as illustrated and driven forward to the silo.

An average pasture cuts about 30 cwt. of hay or 6 tons of silage per acre, but yields of 3 tons of hay and 12 tons of silage are not uncommon.

### *The Cost of Harvesting*

Figures obtained from several reliable sources show that it costs about 12s. per ton to make grass silage in a large way, and 15s. on a smaller scale. Loose hay costs 20s. to 25s. per ton to harvest, and baled grass hay from 25s. to 40s. These figures allow the farmer wages and costs for horses and machinery, but are based on efficient going. Even at 30s. per ton the nutrients in grass-hay cost less than ½d. per lb., whereas, at the present time, the nutrients in the cheapest purchasable fodders such as whole wheat cost 1d. per lb. In chaff at £9 7s. 6d. per ton the nutrients cost 3d. per lb. Grass hay is more than twice as cheap as any purchasable fodder. In addition much of its cost is not directly paid out, but is represented in current farm wages, depreciation, &c.

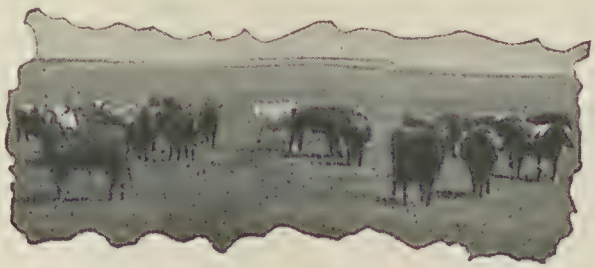
Although silage costs less per ton, it is more costly per food unit, because 3 to 4 tons of silage are required to supply the same number of nutrients as 1 ton of hay. The average composition of a number of samples of good pasture hay and silage is as follows :—

| — | Pasture Hay. (Mixed Grasses and Clovers.) | Pasture Silage. (Mixed Grasses and Clovers.) |
|---|---|---|
| | % | % |
| Moisture .. .. | 16·2 | 78·4 |
| Dry matter .. .. | 83·8 | 21·6 |
| Ash .. .. | 7·2 | 2·1 |
| Protein .. .. | 12·1 | 4·6 |
| Fibre .. .. | 20·7 | 6·2 |
| Carbohydrate .. | 42·2 | 7·5 |
| Fat .. .. | 1·6 | 1·2 |

It will be observed that nearly four times the weight of pasture silage has to be handled to supply the same quantity of dry matter as a given quantity of pasture hay.

The difference between the cost of conserving loose and baled hay is small and, considering the convenience of having the hay in bales, the extra cost is warranted.

Wire for baling will be difficult to obtain this year, and, to avoid a shortage, used wires should be straightened for re-use. One hundred-weight of baling wire will tie approximately 10 tons of hay.



# STACK SILAGE

By KEITH HARRISON, Dairy Supervisor

A proper programme of fodder conservation in normal years, and proper utilization at all times of fodder conserved as hay and silage would bring our Victorian dairy herds to a pitch of production at present attained only by a select few.

No annual programme for conserving fodder can be regarded as complete if it does not achieve a supply of wholesome, nutritious food for the dairy herd that will last not merely over the lean period of the year, but will create an ever-growing reserve for years of drought.

Hay and silage are not being utilized properly where they are fed in insufficient quantities to meet all the needs of the cow, having regard to her stage of lactation and pregnancy, and to the deficiencies of pasturage. These fodders together, of suitable quality and in correct quantities, can constitute a full ration for a dairy cow, no matter how bare the pastures, provided attention is paid to her liquid and mineral needs. *If a cow has the capacity,* she can eat enough hay and silage to absorb the digestible nutrients required for her to reach reasonably high production; and the production of a cow of this type would not then benefit materially by the addition of concentrates to her diet. Where little or no other fodders are available, an average milking cow's daily requirements will be met according to her capacity and, as a practical rule-of-thumb measure, by feeding from 35 to 55 lb. of grass silage and 15 to 25 lb. of leafy meadow hay harvested from well-balanced pastures; or by feeding from 80 to 120 lb. of grass silage alone. Compare these quantities with the dribs and drabs of hay and silage commonly fed out to stock as the pastures fail and it will be seen how far short many farmers fall in supplying the needs of their dairy cows, and how urgent is the need to make rational feeding their first care. And feeding is *not* rational while it fails to take care of the cow's maximum needs at all times. For this reason the creation of adequate silage reserves is of paramount importance to the dairy farmer.

### *The Making of Stack Silage*

Farmers desiring to engage in silage-making for the first time will have to rely on the stack method, or give prior attention to the provision of pits and trenches. The latter, once available, are more economical in labour, but not always so in time, if sweeping distances are considerable.

As few as four workers will create useful reserves by adopting the stack method, but the energies of such a small team will be put to better account in filling pits or trenches, if these can be provided before the pastures are ready for cutting.

An efficient outfit comprises seven men, three horses, one mower, and two 9-ft. tumbler sweeps. This allows for one man mowing, two sweeping, three pitching, and one building with the occasional help of one of the pitchers. Required labour units can be reduced by the use of two-horse or powered pusher-type sweeps. It is of first importance therefore to make arrangements for these outfits to be organized. In closely settled areas or on other areas where farm-to-farm labour on a co-operative basis is practised, this should not be difficult. The use of men appearing on seasonal labour registers might fill gaps that would otherwise make impracticable any programme for intensive silage making. Preliminary conferences among interested farmers would make it clear what labour requirements had to be met from outside sources, and if assurances of help were forthcoming from National Service Officers and War Agricultural Committees, a comprehensive programme could at once be drawn up.

Well-made silage has a mineral and protein content comparable with that of the grass from which it is made. What the early-cutting farmer loses in bulk he will consequently make up in nutritive value and in the better after-growth of the cut pasture. So it should be planned to make a start with pastures at the short, leafy stage of 12 inches of growth.

A method of proved efficiency and economy in making 20–30 ton stacks of silage is described hereunder. Advantages of such small stacks are that they are easy to build and to feed out, sweeping distances are short, and the surrounding areas are not cut up.

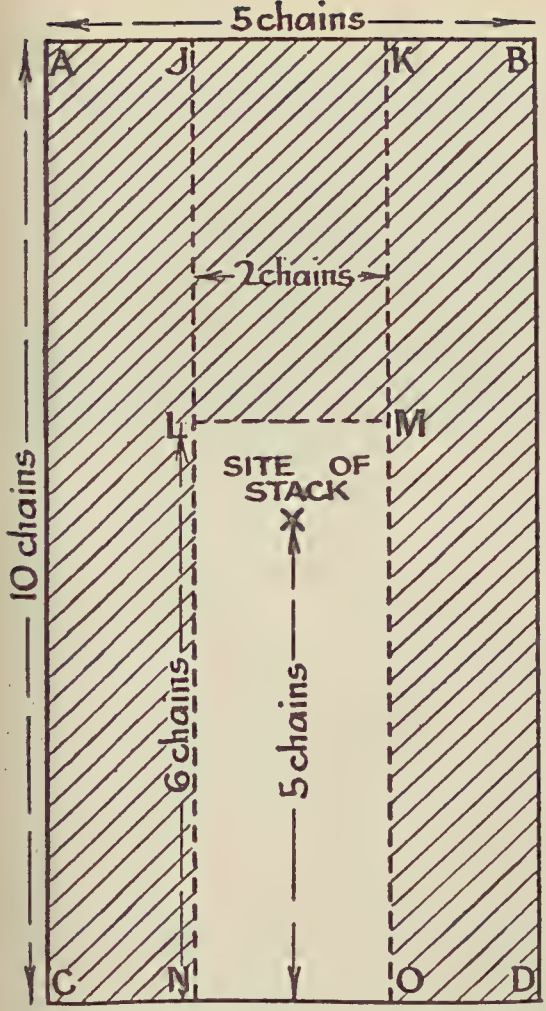



Fig. 1.—A-B-C-D represents a five-acre block. L-M-N-O is the first part of centre section J-K-N-O to be cut.

**Blocking-off and Mowing.**—Peg off pastures into blocks of from four to six acres, according to bulk of growth.

Blocks of 8 to 10 chains by 5 to 6 chains will be found convenient.

The first block to be dealt with is opened up to a length of 1 chain beyond its centre and to a width of 2 chains (Figure 1). The rest of this middle strip can be cut while the other workers begin the stack in the centre of the block.

The grass from this strip will be as much as can be stacked by hand for the first day. The mower then is moved to the next block to open up another centre section. Thereafter, blocks are mown daily to whatever extent the grass can be handled.

**Building the Stack.**—Grass is swept together until the horses can no longer walk over the heap, which is then made neatly circular by means of an 8 ft. rope tied to a fork standing in the centre. A man moving around with this rope describes the circumference of a 16 ft. circular stack, the other workers trimming the edges and forking the surplus on to the stack. Sweeping and stacking are then proceeded with until pitching is no longer easy. Work is then begun on the next stack.

It will be found that three men pitching can handle the most tangled masses of subterranean clover likely to be swept to the stack. Hoists, which are desirable on big stacks, may be dispensed with on these small stacks. However, such aids should be adopted wherever practicable to reduce the arduous labour involved in stacking. Hand pitching, however, enables a more even distribution of greenstuff on the stack and at the same time needful attention can be given to keeping the sides well trimmed.

**Stacks in Series.**—Depending on the proximity of the blocks to be cut and upon the general organization of the team, from 4 to 6 stacks can be built at once, taking from one to two weeks to complete. Rain need not interfere with stacking except so far as it concerns the comfort of the workers, and the aim should be to complete each series of stacks within a week.

**Compression.**—If the top of a stack is kept level during building, firmly trampled, and rounded off to finish, while its sides are kept

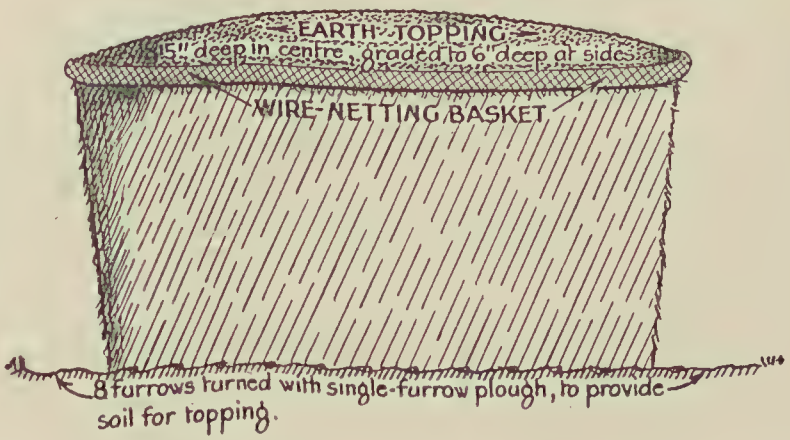

EARTH TOPPING
15" deep in centre, graded to 6" deep at sides
WIRE-NETTING BASKET
8 furrows turned with single-furrow plough, to provide soil for topping.

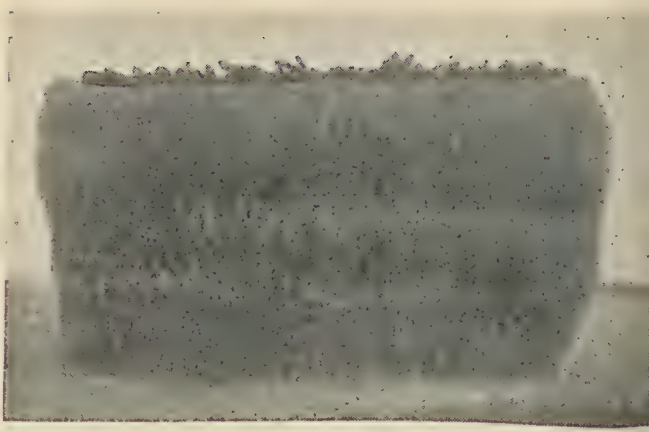
Fig. 2.—An earth-topped stack of grass silage.

straight and firmly packed, spoilage will be reduced to a minimum by sealing and weighting the top with earth. This operation may be left until each series of stacks is completed.

Fig. 2 shows a simple and effective method of topping a stack with earth.

The netting basket is made from old wire-netting. The required length of this may be determined by a rough measurement of the stack's upper circumference. Cut the netting to this length, and cut two pieces of fencing wire 3 ft. longer than the netting. Thread one piece of wire along one edge of the netting and the other piece 12 inches from the same edge. Place the netting flat around the top of the stack with the 12-inch threaded portion overhanging the edge, and tie together the ends of the inner wire. Throw enough earth on to netting to keep firm, while six or seven wires are run across the centre of the stack and tied without slack to the inner wire. Turn up the outside 12 inches of netting, basket fashion, and tie together the ends of the outer wire (12-inch netting can be used by threading fencing wire along each edge. More cross wires are required than for 42-inch netting.) Then evenly fill the "basket", as shown, with earth shovelled from a small area ploughed around and as near to the stack as possible. The wire sides will bulge and give an overhang to the topping.

**Points to Note.**—If the stack is being built on an exposed site in windy weather, take the trouble to hang a bag sheet on the windy side of the stack, otherwise it will settle unevenly. This may result in the stack toppling over, or at least, in a lopsided stack of non-uniform feeding quality. Where it is impracticable to provide such a shield, have the pitchers operate as much as possible on the windy side. The extra trampling on that side will help the exclusion of air.



If silage stacks are intended for early use, weighting may be effected by other methods than topping with earth.

Take care to cut no more grass than can be stacked each day. It is preferable to mow no more in the morning than can be stacked by noon and to mow after lunch for the afternoon's stacking.

Grass trampled during initial cutting will be picked up cleanly by mowing in opposite direction.

The earth top should be inspected a month after making, and any cracks repaired with more earth. This particularly applies to stacks intended to be held for a long period.

Grass silage deteriorates quickly, when exposed to air or rain. Therefore, in opening up a stack, uncover only a small section, and feed out all the material in that section before throwing off more earth. A sharp axe is the handiest tool to use in cutting.

It takes approximately two cubic yards of grass silage to weigh one ton. Aim to conserve at least two tons of silage per cow annually. Any of the silage not used can form a reserve supply. Don't be niggardly with the silage ration. Start with a daily ration of 5 lb. per cow, eventually feeding out enough each day to make up fully for any lack of pasturage or other fodder, and finally, don't let the season advance too far before commencing to feed silage.

# STANDARD HERD TEST

## Report for Year 1944-45

By W. J. YUILL, Supervisor of Herd Testing

A common feature of many low rainfall periods in the past history of Victoria has been their culmination in a major drought year, and subsequently a sequence of good rainfall seasons. Such years followed the 1901–02 and 1914–15 droughts, and it is to be hoped that history will repeat itself following the disastrous drought years of 1944–45.

Last year's Standard Herd Test Report referred to the average butterfat yield as having been adversely affected by the dry winter, the lean spring and hot summer. During the year under review however the conditions were even worse. In all other drought periods those who could afford to do so were able to purchase hay-chaff and concentrates at famine prices. On this occasion however, feed could not be obtained by many stockowners at any price. Generally, the State went through a most serious ordeal, although the coastal belt and some irrigated properties did not suffer to any great degree.

The surprisingly good average yields of many herds and cows during the past year, and the relatively good average yield of 334 lb. butterfat from 2,183 cows of all ages, is largely due to the fact that a relatively high proportion of the Standard Test herds are located on especially well-favoured farms in the higher-rainfall areas, or on irrigated properties. Where the same class of stock is tested under the more varied conditions existing on the general run of dairy farms however, much lower yields must be anticipated.

### *The Champion Herd*

The four highest-producing herds of last year again occupy these positions, but in different order. In 1943–44, the "Mornmoot" herd led the "Belgonia" herd by one-tenth of a pound of butterfat, the smallest margin ever to separate leading herds in the Standard Test. The "Yarraview" Guernseys occupied third place, while Mr. H. Jackson's herd of twelve Jerseys had the highest butterfat average for the year. There was not a sufficient number of cows in this herd however, to permit it to compete for the Championship.

Mr. P. J. Maloney's "Belgonia" Jersey herd, champion for 1944-45 with an average yield of 503 lb. butterfat.

"Yarraview Le Mode," Mr. A. E. T. Payne's mature Guernsey yielded 963 lb. butterfat, but was ineligible for the championship (see text).

This year the irrigation settlements enjoyed a definite advantage over all other areas, while the coastal belt experienced much better conditions than most other portions of the State. This is evidenced by the fact that practically every prominent herd of cows mentioned in this report is located in these areas.

Mr. P. J. Maloney's well-known "Belgonia" herd, with considerably reduced numbers as compared with last year, left no doubt as to its championship form on this occasion, for it obtained a clear lead of 34 lb. butterfat per head when all allowances had been added. The splendid average yield of 503 lb., is exactly the same as the performance that brought "Belgonia" the Reserve Championship in 1926, nearly 20 years ago. Mr. Maloney's herd is practically a two-bull herd and, in this respect, is unlike many other prominent herd-test teams, where each bull is represented by very few daughters. Seven prominent herds in the last Annual Report had 250 tested cows, which represented 86 sires, an average of less than three daughters each. The "Belgonia" herd is composed mainly of daughters of "Aim High" (Imp.), and "Baron Design" (Imp.). The inheritance of these two great sires appears to have blended to an unusual degree. An early survey of "Aim High" indicated his ability to sire daughters able to maintain a 500-lb. butterfat level. This he has proved capable of doing. "Baron Design's" 20 daughters have averaged 406 lb. butterfat on their first calf. The splendid inheritance of "Aim High" and "Baron Design," together with expert management and excellent environmental conditions, have earned a well-merited success for their owner.

### *The Reserve Champion Herd*

The Reserve Championship was gained by the "Lockington" Jersey Stud owned by Mr. H. Jackson by a small margin over the 33 "Mornmoot" Jerseys, last year's Champion herd. Mr. Jackson has had a particularly successful history with winning herds of cattle. Before leaving England he controlled his father's Shorthorns which won the Mortimer Challenge Silver

Mr. R. M. Chirnside's mature Jersey "Mornmoot Princess Madeira" produced 634 lb. butterfat.

Cup. In 1940, his herd of 38 grade and purebred cattle led the Victorian United Cow Test Association averages for the State; while last year, his small herd of Jerseys had the highest butterfat yield for the year, but was not eligible for the championship. On this occasion, his larger herd has secured the Reserve Championship in competition with the best breeders in the State. Because of expert management and the quality of the young cattle in the herd, the "Lockington" Stud can be expected to hold a prominent position in future years.

### *Other Herds*

The 1943 Champion herd of Mr. A. E. T. Payne had a 516·6 lb. average yield for 25 cows. An unusual feature of this herd is the 620 lb. butterfat average of its eight mature cows. Six of these, namely, "Le Mode," "Siren," "Roulette," "Teeny," "Rougette," and "Essie," all appear among the list of cows producing over 600 lb. butterfat in this year's test.

The "Windrest" herd of 37 had a splendid average yield of 503 lb., for seventeen mature cows, most of them being daughters of "Gadget" (Imp.), which bull was largely responsible for bringing the "Windrest" herd into the reserve position during the years 1942 and 1943.

The herd of Messrs. S. Masters and Son of Swan Hill occupies sixth place. The eighteen head in this herd are very even. The yields are meritorious in that they are produced mainly from farm feeding and, therefore, have a high commercial value.

The large "Mer Vue" herd had 38 cows to finish the test in time for inclusion in this year's report. "Mer Vue," like all large herds, especially those that must pass through the severe South Gippsland winter, will always be somewhat handicapped. The immediate future of the herd appears sound due to the fact that fourteen junior and senior two-year-olds have the splendid average yield of 350 lb. butterfat.

The 438 lb. average yield of Mr. R. H. Mitchell's "Clifford Farm" Jerseys at Linton is a meritorious performance, for this district appears to be one of the most unlikely places where high production yields might be expected. Yet Mr. Mitchell's herd always occupies a prominent position among the State's best. The results obtained reflect great dairy ability in the cattle and capable management by their owner.

The herds of Messrs. H. W. Waterhouse and Son of Pakenham and Mr. W. C. R. Gay of Yarram also have excellent averages.

Among the group of herds with over 50 cows, there are some good yields for such large herds. They include the 52 "Maxon" Jerseys of Messrs. G. A. McNabb and Son of Irrowillipe East (432 lb.) and the 58 Werribee Research Farm red polls (416 lb.); also Mr. R. H. Maher's 53 "Rosemont"

Mr. H. Jackson's "Lockington" Jersey herd, which secured the Reserve Championship with an average yield of 537 lb. butterfat.

"Siren," Mr. A. E. T. Payne's mature Guernsey, the Champion Herd Test cow of the year with a yield of 716 lb. butterfat.

Jerseys with a 431 lb. butterfat yield. Mr. W. K. Atkinson's 55 "Willow Park" Shorthorns (386 lb.); and the 371 lb. average of a similar number of "Sylvan Hill" Jerseys, owned by Messrs. Smith Bros., must all be appreciated, on the known difficulties of controlling large herds, as compared with small ones.

In the small herd section the lead goes to the 10 Jerseys owned by Messrs. O. Ronalds and Son. This small but highly efficient herd has been built up from the lines of breeding that have been prominent for a quarter of a century. The eleven cows of Mr. J. O'Neill's "Ullina" Jersey stud at Echuca; a similar number in the "Ballam" Jersey herd of Mrs. A. A. Dennis at Frankston; and also the "Pine Ridge" stud, and the "Bamawm" herd belonging to the Estate of the late F. A. Williams, have all exceeded the level of 400 lb. average actual butterfat, without allowances.

The report contains the yields of many other herds that have done well, despite labour difficulties, the bad season, and shortages of fertilizers and concentrates.

High herd averages are a measure of the managing ability of the owner, plus the hereditary capacity of the cows in the herd; but the real value of the herd to the breed and the industry, as well as the future of the herd, will be bound up with the calibre of the bulls that are bred in it.

### *The Champion Cow*

The high yield of 975 lb. utterfat, which secured for "Yarraview Le Mode" the 1943–44 Standard Herd Test Championship, together with the State butterfat record for all breeds and all ages, was followed this year by another high yield. No other cow has ever approached the remarkable average yield of this cow. Unfortunately, her 963 lb., yield on this occasion does not earn the championship for "Le Mode" due to the fact that she returned to service and recalved outside the time-period stipulated for the championship honour. However, the championship still goes to the "Yarraview" stud

"Jindivick Heroine 16th," Senior four-year-old Jersey owned by Messrs. O. Ronalds and Son, is Reserve Champion for the year with 675 lb. butterfat.

for the performance of "Yarraview Siren," the second highest yield for the year. Her 11,732 lb. milk and 715 lb. butterfat, are the best of her many records, although her present lactation suggests that she will be heard of again in the near future. "Siren" began her testing career as a 407 lb. butterfat junior two-year-old, and went on to produce yields of 520, 528, 574, 520, and 585 lb. These figures do not do her justice, as is the case with so many of our really great cows, because of the Australian Herd Test system of restricting the test to the first 273 days of the lactation period.

Mr. F. W. Clarke's mature Jersey Cow "Mer Vue Sister" produced 694 lb. butterfat.

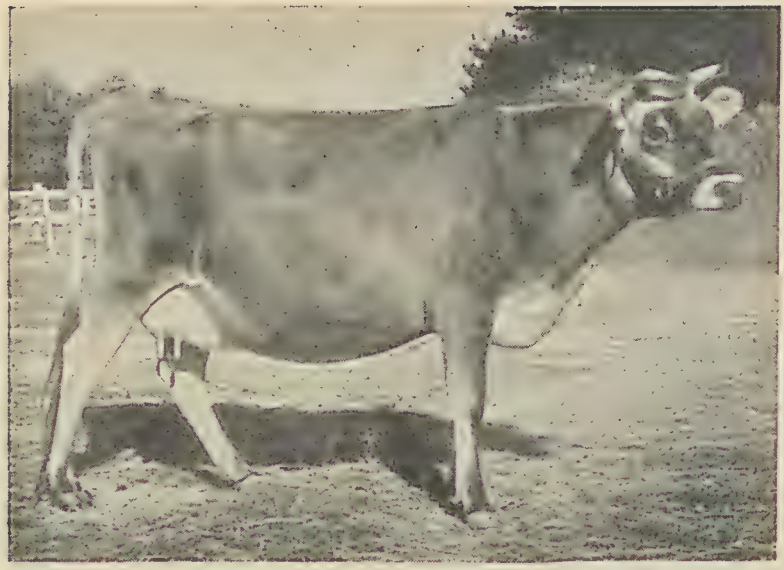
"Siren's" "last day's milk," has averaged over 30 lb. The sires of "Siren" and "Le Mode" are both sons of "Camilla of Maple Lodge," a noted Guernsey Island cow. Last year's champion is even more closely bred to "Camilla," for her dam was sired by yet another son of this cow. Since coming to the "Yarraview" stud, "Camilla's Majestic of Maple Lodge" has sired some remarkable daughters, including "Siren," the champion cow. This bull's value was early appreciated, following a survey indicating his ability to sire daughters that exceeded their dams by more than 100 lb. butterfat. That early forecast has been substantially realized by the average yield of all his daughters to date. "Camilla's Majestic" is a proven sire of unusual merit. This is best seen in his many long-lived, high-yielding daughters, several of which exceeded the 500 lb. butterfat average for all yields, including those made at junior ages. The foregoing table gives an indication of the worth of these cows.

DAUGHTERS OF "CAMILLA'S MAJESTIC OF MAPLE LODGE".

| Name of Cow. | Number of Records. | Butterfat Average of all Yields. | Highest Butterfat Record. |
|---|---|---|---|
| | | lb. | lb. |
| Yarraview Essie .. | 9 | 500 | 614 |
| Yarraview Teeny .. | 7 | 556 | 688 |
| Yarraview Siren .. | 7 | 550 | 716 |
| Yarraview Julie .. | 7 | 533 | 707 |
| Yarraview Ella .. | 4 | 575 | 685 |
| Yarraview Songstress 2nd .. .. | 2 | 500 | 573 |

"Vermont Lola," Dr. F. G. Stephens' Junior two-year-old Guernsey which topped her class with 492 lb. butterfat.

The eight mature cows in the "Yarraview" herd have the excellent average yield of 620 lb. butterfat. "Roulette" occupies second place in the



"Belgonia Junette 15th," the leading Senior two-year-old, owned by Mr. P. J. Maloney, yielded 571 lb. butterfat.

a high place in the Advanced Register. So also has this cow's remarkably efficient dam "Heroine 8th," which began her eighth lactation at ten years of age. "Heroine 8th" looks as if she might enter the select group of two-ton butterfat cows at an early date. "Heroine 5th," her dam, produced up to 631 lb. butterfat as a mature cow. "Master Babs," the sire of "Heroine 8th," was linebred to the Champion Senior Four-year-old Jersey, "Babs of Somerville," whose 843 lb. butterfat still stands as a State class record. "Master Babs" was by "Reputation," a son of "Babs," and from a grand-daughter of this famous producer. Much was expected from "Heroine 16th" for this cow possessed great dairy temperament and was an easy cow to handle. She finished strongly after her heavy year, but unfortunately died after calving.

senior four-year-old class with 627 lb. butterfat; while the splendid yield of 593 lb., brings "Chamois" into third position amongst the junior four-year-olds.

### *Reserve Champion Cow*

Although two other cows had higher yields, the Reserve Championship goes to a remarkable young Jersey "Jindivick Heroine 16th," owned by Messrs. O. Ronalds and Son. This cow was second in the junior four-year-old class last year with a 572 lb. butterfat yield. Her present effort of 674·9 lb., places her among the unusually high yielders of the breed and of the State. On her first four records she has earned

Two other prominent herd-test cows came close to winning the Reserve Championship, but they failed to recalve within the minimum period of fifteen months from the previous calving date. One is "Bamawm Lass 2nd," which narrowly missed the Reserve Championship in 1941, with a record of 750 lb. butterfat. On this occasion, she missed the 700 lb. level by the narrow margin of 1 lb. of butterfat. Her dam "Ballara Bonnie," is one of the most famous high-yielding cows

Left: "Surrey Buttercup 15th," leader of the Junior four-year-old class with 649 lb. butterfat. Right: "Milvue Aim's Coronation," winner of the Senior three-year-old Section with 645 lb. butterfat. Both of these juniors are owned by Mr. H. Jackson.

[*Continued on page 403.*

# Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.
Live Stock Science Officer

## *Dairy Cows*

THE arrival of spring accompanied by a rapid increase in the rate of pasture growth will be welcomed more warmly than usual by farmers who have been struggling for many months to keep their stock alive with almost any type of foodstuff that could be procured.

Pasture is the most economical of all crops, and its value is probably not appreciated to the same extent in Victoria as in countries where a cold winter climate is experienced and costs of production are greatly increased by the necessity to house and wholly hand-feed stock during the winter. In this State it is taken for granted that dairy cows will remain in the paddocks throughout the year, that for some months the whole of their nutritive requirements will be supplied by grazing only, and that in normal years they will at no time have to be wholly maintained with expensive purchased or stored home-grown fodder.

Experience has shown that best use cannot be made of pastures if cows are allowed continuous access to the whole grazing area throughout the growing season. The rotational system in which the herd is grazed successively in a number of paddocks has now been adopted on many dairying properties, especially those which can be irrigated. Rotational grazing allows pasture in the unoccupied paddocks an opportunity to grow unchecked, and an increase in milk yield is always noted at each change to fresh pasture.

When pastures are luscious and abundant, the average dairy cow will maintain her maximum production without any supplementary feeding at all, but high-producing cows may not be able to eat enough pasture grass to enable them to yield to their full capacity. It usually pays to feed such cows a small amount of crushed grain, pollard or other concentrate rich in carbohydrates. As luscious spring pastures are rich in protein, however, it may not be economical to offer the cows protein-rich concentrates such as meatmeal or linseed meal.

Cows enjoy variety and a portion of chaff in the bails or some hay in the paddock is appreciated by them. Although the effects of this practice may not be apparent, the dry roughage will help to maintain normal bowel activity. The amount fed, however, should not be so large that the cows' appetite for pasture will be appreciably lessened.

Unfortunately spring conditions do not continue indefinitely, and on properties where there is no irrigation, the pastures begin to deteriorate and the milk yield declines as the summer progresses. As soon as this is noticed, supplementary feeding should be commenced. The maintenance of milk yield by feeding roughages and concentrates is profitable up to a certain point. The amounts of supplements which should be fed and the point at which further supplementary feeding becomes uneconomical can be determined only by constant observation and calculation.

The Victorian dairying industry is entering a period which will be marked by a considerable decrease in the number of dairy cows. The only immediate counter to the resultant drop in production will be better feeding to increase the average production of all the cows in the State. If the seasons are favourable and concentrates become more plentiful, there is no reason why this could not be done to the extent of raising production by 30 or 40 lb. of butterfat per cow.

(J. T. KELLY, B.Agr. Sc., Science Field Officer.)

## *Worm Infestation of Calves*

Reports of losses in young cattle due to worm infestation have come in recently from many Victorian districts, and it will assist greatly in planning measures for the control of these parasites if their life history and the conditions under which outbreaks occur are understood.

In Victoria, the commonest internal parasites of cattle are fine hair worms or *Trichostrongyles*, which infest the stomach and small intestine. Eggs are passed in the droppings of infected cattle, and hatch out under suitable conditions of moisture and warmth. In three or four days the larvae are ready to infect other cattle. In cold or dry weather, development may be retarded, but the eggs and infective larvae may remain alive for over a year. The larvae crawl on to the grass and are eaten by stock. Once they reach the stomach or intestine, they penetrate into the mucous membrane lining, grow into worms, and lay microscopic eggs in large numbers within about three weeks.

Although there may be thousands of worms in the intestine of an animal, they are so fine that special measures must be taken to see them. Young cattle particularly may show symptoms, especially if the pastures are poor, and weather conditions are favourable for the hatching of worm eggs.

The worst outbreaks occur in autum, winter and early spring. Badly affected stock do not thrive, and develop a profuse dark diarrhoea. They lose condition rapidly, become hide-bound and anaemic, and often die within a few weeks.

There are several conditions which predispose to a high degree of infection. If paddocks have been heavily stocked with cattle for a long period the infestation of the pasture may be built up. When the rains come after a long dry period, a mass hatching of eggs may occur, and symptoms of worm infestation begin to show up in a few weeks.

### Treatment.

The most effective treatment for worms in cattle is to drench with Phenovis or Phenzeen in doses of half an ounce for calves up to six months, three-quarters of an ounce for heifers up to a year old, and one ounce for older stock. Drench three times at intervals of fourteen days.

In areas where worm trouble is common, it is well to anticipate losses by drenching in the autumn before outbreaks occur, in winter, and again in early spring.

Don't overstock. Graze calves on fresh country apart from other cattle, avoiding wet and swampy areas. When feed begins to go off, commence supplementary feeding. Hay is best fed in racks to prevent faecal contamination of the feed.

Cattle are susceptible to other internal parasites than the hair worm, such as pimply gut worm, but the same lines of treatment and prevention apply as for hair worm.

If a sample of the droppings from an animal suspected to be infested is sent in an airtight container to the Veterinary Research Institute, Story Street, Parkville, a diagnosis will be made.

[L. P. Prewett, B.V.Sc., Veterinary Stock Inspector.]

## *Decrease in Pig Numbers*

The total number of live pigs in Victoria at 31st March, 1945, as published by the Victorian Government Statist, was 296,232, a decrease of 12 per cent. from the number in the previous year.

It should be remembered that in March, 1944, there was still some carry-over of pigs from porkers to baconers, following the restrictions placed on the slaughter and sale of pork in August, 1943, and that carry-over increased the number of pigs shown by the Statist.

The number of breeding sows in 1945, was 15 per cent. lower than in the previous year. Some of that reduction would be due to readjustment of breeding programmes to produce fewer but heavier pigs.

More significant, and indicative of a marked decline in pig breeding is the 12 per cent. decrease in the number of boars since last year. Some farmers have discontinued pig production and others have stopped breeding and purchased stores, while still others discarded boars with the intention of replacing them when conditions are more favourable to pig raising. It seems reasonable then to expect that in the near future there will be a strong demand for boars ready for service. Stud pig-breeders who supply most of the boars used by other pig breeders are not able to retain large numbers of boars of serviceable age in anticipation of an unknown demand, and it is probable that some difficulty may be experienced in obtaining suitable boars. To avoid being forced into the necessity of using "any old boar" because a good one is not available when required, pig breeders are advised to order boars from stud breeders as soon as they know they will want them, either for immediate or later delivery.

The boar has a big influence for better or for worse on the income from pig raising, and for that reason his selection should be carefully planned.

[L. A. Downey, H.D.A., Pig Expert.]

### *Sheep as Fly Traps*

Two sheep dipping trials using D.D.T., the new insecticide, as a preventive measure against the sheep blow-fly were carried out last year at the School of Agriculture, University College of North Wales, Bangor, collaborating with the Unit of Insect Physiology of the Agricultural Research Council.

The trials showed that five weeks after dipping with D.D.T., from 30 to 60 seconds contact with the dipped fleece, was sufficient to poison sheep blow-flies.

This year, extensive trials with D.D.T. as a sheep-dip against the sheep blow-fly and other species are to be made at Bangor. Attempts will also be made to increase the effectiveness of the dip by making it an attractant, thus turning the sheep into walking fly-traps.

D.D.T. is not yet available for general use, but the results of these experiments will be invaluable to farmers after the war when supplies of the insecticide can be released.

(British Ministry of Agriculture Weekly News Service.)

### *Horse Breeding in England*

In 1937 and 1938 over 1,850 heavy stallions were licensed in Great Britain, but in 1941 and 1942 the number fell to 1,200.

The urgent demands for horse labour for agricultural work at the outbreak of war was the cause of this falling off in stallion licensing, as farmers could ill afford to lose the working time of their mares for even a short period of the year. In consequence many stallions were gelded.

There are signs now of a revival in heavy horse breeding, and last year over 1,300 heavy stallions were licensed. Preliminary figures indicate that this total will be maintained during the present year.

Light horse breeding has suffered even more severely. In 1938 and 1939 over 200 light stallions were licensed, but there were less than 80 in 1943. About 90 light stallion licences were issued last year. Pony and cob stallion licences declined by 50 per cent. between 1939 and 1943.

(British Ministry of Agriculture Weekly News Service.)

### *Handling Poultry*

On the farm, in the market, at poultry exhibitions or shows, or during transit, it is inexcusable to handle poultry roughly. Even carrying them by the legs or wings is objectionable, and may quite easily result in injury.

#### Catching Fowls.

In selecting fowls for breeding and in culling fowls for marketing carry out the work in laying houses by placing a wooden framework covered with wire-netting, approximately 6 ft. high, across one corner of the house. Carefully drive the birds behind this partition where a helper located behind the framework may catch the birds quietly. An opening in the framework, about 3 ft. from the ground and extending to the top, will enable the operator to pass the birds through. A bag nailed at the top and allowed to hang down over the opening will prevent the birds from escaping.

#### Crating Poultry for Market.

Make sure that there is sufficient room in the crate. If overcrowded, the birds may become injured or die in transit. Further, there is always a risk of the birds dying if sent to market in very hot weather. When the distance to market is great, give the birds food and water just before they are despatched. For turkeys, straw should be placed in the crate to avoid damage to the breasts, and the different sexes should be placed in separate crates. If a small lot is placed in one crate, the males and females should be separated with a division. Various sizes and kinds of poultry should always be separated.

The practice of dropping crates of poultry heavily on the ground during loading or unloading operations, or handling poultry roughly as they are being moved in or out of transport crates is most detrimental to the birds, apart altogether from humanitarian considerations.

#### How to Handle the Birds.

The proper way to handle a bird which has been caught is to pass the hand under the breast, from the front, and grasp each thigh between two fingers. Now raise the bird, and tuck it beneath the arm, lightly but firmly pressing the wings between the elbow and the body, the bird's head facing the rear of the operator. The process may be repeated with the free hand, and in this way two birds may be carried about comfortably. When taking a bird out of the show pen, never drag it backwards by the legs, but turn it until it faces the opening, grasp it firmly by both wing

shoulders, pressing these to the sides, turn it to one side and draw it carefully out. Sometimes a quiet bird may be taken out head first without any special precautions. To examine its points, pass the left hand under the breast, from the front, and grasp each thigh between two fingers. The right hand is free to examine head points, wing, and under colour, &c., and further examination of other parts of the bird may be carried out by moving the bird to the right hand.

Poultry breeders should handle birds occasionally to see if they are in good condition, or affected with vermin. All sick birds or birds in poor condition should be separated. Nothing will enable a poultry farmer to become better acquainted with his stock than such periodical inspections.

[H. F. Clinton, Poultry Expert.]

### *Spring Management and Swarm Control of Bees*

As queens are now expanding their brood nests in many localities, it is advisable to see that the colonies have abundance of stores in reserve. It is essential to have at least 12 lb. of stores available, as many queens are reluctant to expand if stor s are short.

When queens are slow to expand, it is a good policy to scrape the surface of the capped honey in a ring around the brood. This causes the bees to clean up and distribute it, and in the process they feed it more copiously to the queen, causing her to increase egg production. Queens slow to expand should be recorded and replaced if any doubt exists as to her future usefulness. It is a poor policy to expend energy in the way of added brood and bees if the queen is worn out. Replace with a good queen before any attempt is made to build the colony up by adding bees and brood from strong colonies.

A thorough overhaul should be made of the apiaries, and preparations put in hand to deal with swarming.

Colonies should be classified into three categories, strong, medium, and weak, and marked accordingly. The colonies marked weak evidently suffer a disability. Poor queens or lack of stores may be the cause. If lack of stores is the only cause, and the queen is all right, it can be remedied immediately by supplying stores, and exchanging locations with a fairly strong colony, allowing it to collect the field bees of the latter. Smoke should be used if the bees show any inclination to fight. Little can be done for the other weak colonies, except to see that stores are sufficient until queen replacement can be carried out. They may be kept intact and prevented from becoming extinct by shaking young bees from brood combs from another colony in front of the hive on a warm day. These young bees will enter the hive and strengthen it.

Medium colonies can be brought up to strength by exchanging locations with the strong ones and supplying brood, when the cluster is in a condition to cover and care for it.

Great care must be exercised to see that disease is not present, when exchange of combs and brood is carried out.

Full bodies of good worker combs should be sorted out and kept on hand for use later.

When a colony is expanding rapidly a set of worker combs placed below the brood nest will many times relieve hive congestion, and allay swarming. Unwanted queen cells should also be destroyed. Queens that have headed colonies through a heavy season the previous year are likely to be replaced by a new young queen. This is often confused with swarming, as colonies take advantage of spring conditions for queen replacement.

Requeening a few weeks previous to the advent of the swarming season will eliminate supersedure (queen replacement) and cut down swarming to a great degree.

Good supplies of first class brood combs and judicious management will, in most cases, forestall swarming.

Exchanging locations with weak colonies or nuclei, headed by young queens will, in most cases, forestall swarming in strong colonies. Super room must be added to the weak colonies or nuclei to cope with the extra bees after the exchange has been carried out. Smoke copiously when exchanged. It is necessary to carry out this manipulation before cells are started in the strong colonies as bees, after queen cells get under way, are in a "stay-put" humour, and the fielders have the intuition of re-locating the hive even when moved several times.

When a colony has cells started, it can be treated in the following manner:—Place the hive to one side and in its place put down a hive containing a set of worker combs or full sheets of foundation. Look up the queen in the old hive and place her with a frame of unsealed brood in the centre of the new brood nest; also a comb of stores next to the hive wall. If the colony is strong, supply super room to the hive and shake most of the bees from the original hive into the new brood

nest, leaving enough bees to care for the brood in the original hive. If the drawn cells are of poor stock in the original colony, destroy and replace with cells from good breeding colony. If no increase is desired, the two colonies can be united at a later date using the young queen to head the colony.

If colonies still persist in building cells after being shaken into the new hive, it is evident that supersedure is under way, and the queen needs replacing.

When the swarming season is on, it is advisable to have ample water about the apiary and a good spray pump. Use the water freely on the flying swarmers and they will soon cluster. Spray the clustered swarms if they are inclined to rise when hiving.

[W. A. Collins, Apiary Inspector.]

# Tubercle-free Herds

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

| Name. | Address. | Number in Herd. |
|---|---|---|
| Aboriginal Station | Lake Tyers | 109 |
| Armstrong and Son | Wangaratta | 105 |
| Ballarat Orphanage | Ballarat | 129 |
| Banyule Stud Pty. Ltd. | Wangaratta | 54 |
| Beggs, A. R. | Beaufort | 88 |
| Black, I. S. Estate | Mount Noorat | 60 |
| Carne, W. J. | Pakenham Upper | 27 |
| Clark, W. J. | Monomeith | 130 |
| Cowan, G. L. S. | Bacchus Marsh | 59 |
| Cribbes, T. | Wangaratta | 39 |
| Deering, J. T. | South Wangaratta | 61 |
| Dennis, Mrs. A. A. | Frankston | 30 |
| Dookie Agricultural College | Dookie | 92 |
| Foletta G. G. and Son | Buxton | 109 |
| Gardner, Mrs. A. E. | Lang Lang | 63 |
| Geelong Grammar School | Corio | 78 |
| Gorman, A. W. | "Cathcart," Alexandra | 78 |
| Griffin, G. W. | Gladysdale | 50 |
| Griffiths, J. G. | Benalla | 151 |
| Gross, Mrs. G. F. | Green Lake | 21 |
| Hamilton, A. | Flinders | 64 |
| Howlett Mrs. G., and Miss E. Samuel | Lang Lang | 55 |
| Jakobi, L. W. | "Granada," Yannathan | 89 |
| Johnson, F. G. | Horsham | 11 |
| Kane, F. E. | Warrnambool | 28 |
| Lady Talbot Milk Supply Co. | Cranbourne | 489 |
| Lawrence, P. H. | "Rainga," Tarrawarra | 83 |
| Longerenong Agricultural College | Dooen | 42 |
| Maloney, P. J. | Tongala | 66 |
| Murray, M. G. | Lima | 26 |
| McNabb and Son, G. A. | Irrewillipe East | 159 |
| Nancarrow Bros. | Kerang | 47 |
| Noonan, G. | Benalla | 29 |
| Noonan, Mrs. S. A. | Benalla | 51 |
| Northcote Children's Farm | Bacchus Marsh | 165 |
| Onley, W. H. | "Glenholme," Caldermeade | 67 |
| Parker, Mrs. L. M. | Tallarook | 67 |
| Payne, A. E. T. | "Yarra View," Lilydale | 66 |
| Payne, T. E. N. | "Woodburn," Kilmore | 44 |
| Poole, M. A., and D. | Caldermeade | 120 |
| Poole, M. A., and D. | Yannathan | 104 |
| Powell, T. S. | "Carellen," Mansfield | 43 |
| Richardson, Bros., Messrs. | "Faldinghurst," Upper Beaconsfield | 53 |
| Roe, Thomas H. P. | Cobram | 27 |
| School of Horticulture | Burnley | 6 |
| State Experiment Farm | Rutherglen | 47 |
| State Research Farm | Werribee | 245 |
| Stephens, Dr. F. | Vermont | 32 |
| Vagg, T. R. | Officedale | 45 |
| Waterhouse and Son | Pakenham | 55 |
| Wells, W. G. | Caldermeade | 65 |
| Woodyer, P. A. | Mornington | 19 |

In addition to the above-mentioned herds there are 855 commercial dairy herds containing 22,548 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 339 herds in which 11,612 head of cattle have passed one test, and may be considered, therefore, to be in the process of becoming tubercle free herds.

# THE PLANT RESEARCH LABORATORIES*, BURNLEY

## *Wartime Activities*

By S. FISH, M.Agr.Sc., Biologist

THE function of applied biology such as plant pathology and economic entomology during war is very similar to its function in times of peace; it must always contribute to the solution of problems of national importance. During war it assists in conserving food supplies by cutting down such losses in the growing crops and their products as may be caused by diseases and insect pests. In addition to the conservation of food by these means it helps protect other materials required for service and civilian uses, such as flax, timber, service equipment, and also in the production of medicaments such as ergot.

In the early years of the war, Plant Research Laboratory officers advised Defence authorities on matters such as insect pests of wartime importance. This advisory work entailed inspection of army camps and stores by Departmental officers on pest outbreaks affecting army personnel, on stored foods and raw materials vital to our war effort. Apart from those investigations directed at a reduction of losses from diseases and pests in crops of importance to the war effort, special investigations were also made in connexion with such problems as fungal and insect deterioration of Army equipment.

*Flax Diseases.*—An extensive investigation was made of the diseases which occurred in flax crops in Victoria following the great expansion of the flax industry in this State to meet wartime demands. Before these investigations were undertaken, several of these diseases notably "Withertop" (calcium deficiency) and "False" Browning had not been previously described. Not only have the causes of these diseases been determined, but in the case of "Withertop" its complete control in the field has been achieved.

* Biological Branch Dept. of Agriculture

Considerable success has attended efforts which were made to develop selections of commercial flax varieties resistant to Fusarium wilt disease. Promising results have also been obtained from the selection of withertop resistant strains of flax.

*Flax Insect Pests.*—Experimental work on methods of reducing losses to flax from peamites and cutworms has been conducted in the Western District and information on this work, together with that on the flax diseases, has been made available to the Commonwealth Flax Production Committee.

*Vegetable Diseases.*—Owing to the importance of vegetable production much attention has been given to seed treatments for the prevention of seed-borne diseases and pre-emergence damping-off of vegetables. After having tested overseas recommendations for the control of seed-borne diseases of cabbage, cauliflower, and celery by the hot water methods, all the cabbage and cauliflower mother-seed used in Victoria over the past three years has been treated by immersion in hot water at the Plant Research Laboratories for the Commonwealth Vegetable Seeds Committee, and likewise, most of the celery seed grown by the commercial men in the Melbourne metropolitan area was so treated for the prevention of Celery Leaf Spot disease, which it controlled with marked success. The treatment also reduced to a minimum the number of applications of fungicidal dusts, which were previously applied during the growing period of the crop for the control of this disease, thus conserving manpower and materials.

Experimental work was conducted over a number of years in various localities to determine the relative efficiency of available fungicidal dusts in preventing soil fungous pathogens from causing pre-emergence damping-off in vegetable crops. As the result of this work it was possible to provide sound advice for the vegetable industry as to the appropriate seed treatments for tomatoes, peas, and red beet.

The discovery of a hitherto unrecorded virus affecting carrots in Victoria and also throughout Australia was made as the result of work at the Plant Research Laboratories. This disease, carrot virus, was found to be responsible for serious crop failures and yield reductions in Victoria. The seasonal occurrence, its distribution and mode of transmission by means of the carrot aphid vector, were determined and varieties of carrots tolerant to this disease have been discovered.

Varietal resistance trials with beans and onions have also been made to determine the relative resistance of available varieties to Halo Blight bacterial disease of beans and White Root Rot disease of onions.

Advice was tendered on the standards of freedom from virus and other diseases for the Departmental potato virus Seed Certification Scheme. Assistance was also given with the "approved" potato seed scheme, which was adopted to raise the general level of potato yields in the wartime expansion of that industry. Detailed surveys were conducted to determine the effect of the rapid expansion of the potato industry in relation to the potato eelworm problem, and information which should be of practical value to the grower was obtained.

Disease surveys have been made throughout the tomato industry to determine the relative importance of disease in the various areas of this State, and advice on control measures has been supplied to that industry.

*Vegetable Insect Pests.*—Surveys have been conducted by entomologists of the Research Laboratory on any outbreaks of insect pests in the vegetable crops in Victoria and advice on control tendered. Some experimental work was conducted on the control of Tomato Moth, Potato Moth, Vegetable Weevil, and Carrot Aphis, but work was restricted because of the loss of the services of two experienced entomologists.

A parasite service was established for the control of the Cabbage White Butterfly and the Green Vegetable Bug, and as a result, the parasites have been established and the parasite (*Ptermalus puparum*) of the Cabbage White Butterfly is exerting a measure of control. Preliminary work has also been conducted to determine the place of the new insecticide D.D.T. for vegetable insect pest control.

*Fruit Diseases.*—Much work on the control of stone and pome fruit diseases was conducted prior to the war and the information was available for those industries during the war period. Advice was given on the possibility of modified spray schedules in view of the manpower shortage and the shortage of some of the fungicides.

*Fruit Insect Pests.*—Work on fruit insect pests on such problems as Codling Moth of Pears, and Citrus Red Scale was conducted and improvements in the methods of control resulted in a saving of labour and materials. Tests were also made in connexion with substitute insecticides, such as D.D.T.

*Stores Grain and Flour Insect Pests.*—Inspection of grain elevators and wheat storage sites were made for the Grain Elevators Board and the Australian Wheat Board with a view to supplying information on insect pests present and tendering advice. Work conducted at the Research Laboratory enabled a spray material to be developed, effective against these grain insect pests for the cleaning up of storage sites. Investigations were also conducted on the efficiency of fumigation in flour mills for the control of the flour beetle, and work was also carried out to determine the factors influencing species distribution of this type of pest.

*Pin-hole Borer of Fire-killed Mountain Ash.*—At the request of the Victorian Forests Commission an investigation was conducted on pin-hole borer of fire-killed mountain ash; insect damage having threatened to become a factor in reducing supplies of selected quality timber required for war purposes. As a result of field and laboratory studies much information of practical use to the Commission has been obtained, particularly in regard to the factors influencing wood infestation and the biology of the pin-hole borer. Information on the progress of infestation has enabled the Commission to more effectively determine the management of timber dumps and their order of utilization.

*The Prevention of Insect Damage to Respirator Liners.*—At the request of the Ministry of Munitions an investigation was conducted to test methods of prevention of moth damage to the liners of army respirators. This work yielded satisfactory results and a report on it was forwarded by the Ministry of Munitions to the British Authorities.

*Legume Seed Inoculation with Nitrogen Assimilating Bacteria.*—Special strains of nitrogen-fixing bacteria were tested at Inverloch for their capacity to nodulate their respective hosts such as various types of beans, lupins, lucerne, peas, and clovers. Over the two years, some eight hundred cultures have been supplied to growers of the above-mentioned crops to ensure that if the absence of the right strain of rhizobial bacteria is a limiting factor under their particular conditions, that proper nodulation will be secured and the atmospheric nitrogen made available for the plant. In many instances, crops on virgin country, particularly on the poorer soil types, have responded in a marked way to this inoculation of the seed, when used with superphosphate-lime mixtures. Rhizobial cultures have also been supplied to the Army authorities for their vegetable gardens on virgin lands in the north.

*Commercial Production of Ergot.*—Owing to the possibility of overseas supplies of ergot not being available, the Medical Equipment Control Committee and the Department of Supply and Shipping through the C.S.I.R., requested that investigations be carried out in Victoria into the possibility of commercial production of the important drug, ergot of rye. The drug is used in midwifery cases, and for the treatment of shock.

In Victoria these investigations were conducted by the Plant Research Laboratories, and after many difficulties were overcome, it is now possible to produce ergot of rye, equal or better in quality than the best Spanish ergot, and at a cost approximately equal to that of present world parity. The total alkaloid content of the local product has invariably been high. As a result of this work Australia could, if necessary, be made independent of overseas supplies of this drug at any time in the future.

*Tropic Deterioration of Service Equipment.*—Since January, 1942, research work has been conducted on tropic deterioration of service equipment in collaboration with the Munitions Supply Laboratories of the Department of Munitions. A representative from the Plant Research Laboratories was appointed as a member of the Mycological Panel of the Australian Scientific Liaison Bureau and also as a member of the scientific Advisory Committee on Tropic proofing, attached to the Optical Munitions Panel. The chief contribution made to the work by the Plant Research Laboratories consisted of the development of testing methods for evaluating mould-proofing treatments, and these methods have been incorporated into the Australian standards Association specification. Following this, most of the routine testing of textiles for mould proofness conducted in Australia has been handled at the Laboratories. A number of reports have been prepared and have been distributed widely among the Australian, British, and American Services.

# ADVANCED REGISTER OF MERIT FOR PURE-BRED COWS

By W. J. YUILL, Supervisor of Herd Testing

ORIGINALLY herd testing had but one function, namely to measure the milk yield and establish the butterfat content of the various milk samples taken throughout the year, so that an approximate record of each cow might be obtained for the full testing period.

Mr. F. W. Clarke's Jersey bull, "Mer Vue Jupiter," sire of many high-testing daughters.

Men new to testing work at times think that the final figures of a sub-period, or full lactation, are precise even to the second decimal but this is not so. The only way that such figures could be obtained would be to weigh and test each cow's milk daily. This, of course, is economically impossible, and because of repeated investigations into the question it is known to be unnecessary. The daily variation in both the milk yield and the butterfat percentage, when compared with the days immediately preceding and succeeding are so small that any attempt to obtain preciseness of yield would be unwarranted. To obtain the closest approximation to actual milk weights it would be necessary to weigh the milk daily, but investigation here also has indicated that one day's actual milk weights, taken at about the middle of the sub-period, will establish a close approximation of each cow's monthly milk weight.

For all practical purposes, a close approximation of the production of each cow in the herd can be obtained under these conditions. In passing, it may be said that there is no system under which dishonest practices are not possible. This, however, is not the fault of the system, but rather the weakness of human nature.

Criticism is sometimes directed to the inter-month variation in a cow's yield. This criticism almost always occurs when an abnormally high yield has been averaged and never when an abnormally low one has been raised. Extensive investigations have shown that the normal monthly variation in a cow's yield is approximately 10 per cent.

The rules of testing in some countries allow for a 20 per cent. variation before the yield is considered abnormal. In Australia, however, a more liberal interpretation of the position is provided, for 25 per cent. variation is allowed before the abnormal yield is averaged.

### *Continuous Profitable Yields are Important.*

The main object of the Advanced Register is to give special significance to such cows as have shown beyond all doubt that they possess the characteristics of fertility by annual re-calving; longevity by their many years of

usefulness; disease resistance, by their adaptability to their environment; also in yielding in excess of a minimum average.

Some cows which have made spectacular yields, do not appear on the Register; neither do their daughters. On the other hand, great producers of the Standard Herd Test, have all the virtues enumerated; and they, and some of their progeny have held, or are now occupying, leading positions in one or other of the breed sections of the Register. A case in point is where the first and second places on the Shorthorn list are held by a daughter and grand-daughter of the old Champion Test cow "Cherry of Willow Park" (ten years average 600 lb. butterfat). "Murrayville Eve", with ten years average 422 lb. butterfat, is an outstanding Red Poll, which has several decendants on the Register of Merit. There are many similar instances among the Jerseys, including that of the Champion Advanced Register cow "Mornmoot Princess Madeira" (ten years average of 595 lb. butterfat). This cow's grand-daughter "Madeira 9th" is in fifth place with a five-years average of 586 lb. butterfat, while her daughter "Mornmoot Princess Madeira 17th" is ranked high with 540 lb. butterfat on her first four calvings.

At times spectacular production records are made without any consideration being given to their economic value. That such records have a great importance for herd publicity is obvious from the fact that they are extensively used by breed publicity officers throughout the world. The breeder expects to recover his costs in the enhanced reputation of his herd, and the sales of surplus stock—particularly young bulls. Breeders who purchase this stock also hope to profit by some of the reflected glory in their subsequent sales. The breeders of the breed are in a much better position to recover such costs than the dairy farmers, the users of the breed

"TEENY," 688 lb. Butterfat
"ROUGETTE," 778 lb. Butterfat
"ROULETTE," 671 lb. Butterfat
"CAMILLA'S MAJESTIC OF MAPLE LODGE" (Imp.)
"Le MODE," 976 lb. Butterfat
"ESSIE," 614 lb. Butterfat
"SIREN," 716 lb. Butterfat
"JULIE," 707 lb. Butterfat

A group of high-producing "Yarraview" Guernseys owned by Mr. A. E. T. Payne.

whose general means of recovery are through the factory returns. When high bull cost is spread over a large grade herd where many calves are sired, recovery of the bull's cost is much more likely than in a small herd where only a few calves are raised each year.

Breeders and farmers are frequently fascinated by a high production yield of the dam of the bull they propose to purchase. They rarely seek any further qualifications despite all that has been written concerning a dam's record being a poor guide to her son's transmitting ability. A cow's lifetime yield is a much better indicator than is any one record, no matter how high it may be, for many factors of environment, management and heredity enter into the making of it.

"Gadget" (imp.) in Dr. A. R. Haywood's "Windrest" Jersey stud, is represented by eight cows on the Advanced Register.

Interesting data on this point is reported in an investigation by A. H. Ward, Technical Officer of the Herd Recording Council of the New Zealand Dairy Board. The aim of the investigation was to ascertain the extent of the dam's known yield as a guide to her son's transmitting ability. There were 654 Jersey bulls in this survey, and their 9,066 daughters were a few pounds of butterfat lower than the average yield of the dams. There were 114 bulls that lacked any butterfat backing. These bulls had 1,511 daughters which average lower than their 336 lb. butterfat dams. In the section where 43 sons of dams producing over 700 lb. butterfat were considered, it was found that their 656 daughters from dams averaging 361 lb., averaged 352 lb. butterfat. Some of these dams had been put on test for only one yield, but were never again retested. Actually the best group of daughters were sired by sons of "long-distance" or "lifetime merit" cows, that is, cows which, in not more than eight years, had produced at least 2,500 lb. butterfat. The 652 daughters of these sires averaged 370 lb. butterfat, while their dams were only 2 lb. higher in yield.

The Advanced Register has been designed to give more prominence to those cows which recalve regularly and produce at a profitable level over many years. In the conditions for qualification to the Register a 400 lb. butterfat equivalent over four consecutive years is required. That is, a cow must produce 1,600 lb. butterfat within four years of the first calving date and the expiry date of the fourth lactation.

A perusal of the names of outstanding breeding individuals and families listed in the Standard Herd Test booklet will help to an appreciation of the statement that, while some breeds appear to possess the characters of longevity, fertility and high average yield of milk and butterfat more than others, no breed has a monopoly of them.

In this year's Advanced Register 105 additional names appear. Among these names will be found some remarkably efficient young cows, one of the most outstanding, being "Jindivick Heroine 16th" which, in addition to attaining high ranking on the Register, also secured the honour of being Reserve Champion Cow of the year, while on her fourth lactation.

The highest producing Advanced Register Cow is "Yarraview Le Mode". This cow's 810 lb. butterfat average for five Standard Herd Test records to date, is the highest ever made in Victoria by any Test cow of any breed. "Le Mode's" 892 lb. age-corrected ranking on the Register is 71 lb. higher than that of the Ayrshire, "Inverurie Bluebell", the previous best performer.

"Belgonia Junette 5th", with a seven-year average yield of 571 lb. butterfat, now leads the Jersey section. "Victoria Rita", the leader in the Friesian section, has the good actual butterfat average of 498 lb. over her first five yields; while the Ayrshire leader "Alvaston Margot" has a 418 lb. butterfat average over a period of seven years. Several Shorthorns bred at "Willow Park" have but a small butterfat difference in their yields. "Camelia 18th" and "Melba 15th," animals closely bred to the old Herd Test Champion "Willow Park Cherry", still hold the two top places in their section.

For the first time, a representative of the Australian Illawarra Shorthorn breed appears on the Register. She is "Veresdale Bush Bee", with an actual average yield for five lactations of 345 lb. butterfat. "Victoria Volt" leads the Red Poll section with a 443 lb. butterfat average over eleven lactations. Her ranking on the Register is 514 lb. butterfat and her highest

actual yield 537 lb. Six of Mr. F. Butcher's small "Maryville" stud, also appear on the list with long-life yields.

Among the many long-lived cows that appear on the Register, "Sylvan Hill Handsome Girl" is outstanding because of the thirteen completed records that average just under the 400 lb. butterfat level. There are many other cows in this herd that are doing well in the harsh conditions of the long South Gippsland winter, and among the steep hills. A splendid old cow is "Kantara Jasmine", now on her thirteenth lactation. This cow's 420 lb. average for twelve years is an outstanding performance, and her present lactation shows little diminution of her high secreting ability.

"Victoria Volt's" 443 lb. average, that brought her to the top of the Red Poll section, is meritorious, because this cow is also the present longest tested cow of the breed. "Avonview Dulcie", with an eleven year average of 389 lb. butterfat, and "Yarraview Essie" with 495 lb. for nine years, represent the Guernsey breed.

The amount of interest displayed by breeders and farmers in the Advanced Register, indicates their growing appreciation of the importance of this work undertaken by the Department of Agriculture.

A full list of cows which have qualified to be placed in the Advanced Register of Merit will appear in the Standard Herd Test booklet, to be published towards the end of September. Free copies of this booklet may be obtained after 1st October from the Superintendent of Dairying, Department of Agriculture, Melbourne, C.2.

# Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

| Name. | Address. | Name. | Address. |
|---|---|---|---|
| Abrahams, L. J. .. | Red Hill South | Haywood, Dr. A. R. .. | Hastings |
| Baker, J. J. .. .. | Bannockburn | Horn, L. A. .. .. | Leongatha North |
| Beechy, K. .. .. | Pomborneit | Jackson, Wm. C. .. | "Patterdale" Stud, Main Ridge |
| Bidgood Bros. .. .. | Wodonga | Longerenong College .. | Dooen |
| Bodey, A. A. .. .. | "Bonnyview," Dooen | Mundy Bros. .. .. | Orbost |
| Bright, George H. .. | Dumbalk | Noble, T. M. and Sons .. | Maffra |
| Buller, R. A. .. .. | Beaconsfield | Northcote Children's Farm | Bacchus Marsh |
| Castle, L. H. .. .. | Clarinda | Petersen, E. V. .. | Korumburra |
| Cox, H. H. .. .. | Jacaranda Stud, Leopold | Richards, Albert H. .. | Dumbalk, via Meeniyan |
| Critten, H. S. .. .. | Dumbalk | Rintoul, J. T. C. .. | Glengarry |
| Devine, Herbert .. | Swan Marsh | Roy, W. A. .. .. | Morrell's Hill, via Boolarra |
| Dookie Agricultural College | Dookie | Sexton, John .. .. | Swan Marsh |
| Doornbusch, John L. .. | "Starpark," Nhill | Simpson, Ronald D. .. | Birregurra |
| Dowie, Alexander .. | Mt. Moriac | State Experiment Farm | Rutherglen |
| Ellwood, A. H. .. | Paschendaele | Trenery and Sutherland .. | "Promview," Foster |
| Fairchild and Clutterbuck | Tinamba | Trigg, A. J. .. .. | Bungaree |
| Hamblin, A. T. and Sons | Toolleen | Trigg, N. H. .. .. | Bullarook |
| Hardinge, B. and Sons .. | Nar Nar Goon | Tweddle, J. T. .. .. | "Winlaton," Shepparton |
| Harris, Clement C. .. | "Egerton Villa," Loch | Warry, A. and Sons .. | Delburn |
| Harrison, C. T. .. | "Eastside" Stud, Pomborneit | Whelpton, B. .. .. | Whittlesea North |
| Hawton, I. E. and F. .. | "Rossmoyne," Colac | White, G. W. .. .. | Boolarra South |

# Burnley Egg-laying Competition

## Results of Winter Test

By H. F. CLINTON, Poultry Expert

THE thirty-fifth egg-laying competition for fowls, conducted by the Department of Agriculture, at the School of Primary Agriculture and Horticulture, Burnley, commenced on 1st April, 1945, and will continue until 2nd March, 1946, a period of 48 weeks. The competition this year is limited to the section for Individual Birds—Single Test, as in the previous competition.

The winter test, conducted in connection with this competition, included the first four months (122 days), and concluded on the 31st July last. This test is held annually to give prominence to birds that lay well during this period, when eggs are scarce and prices are high. Certificates are awarded for the greatest number of first-grade eggs laid by individual birds in all classes, provided a bird lays 60 first-grade eggs. During the first two months, a first-grade egg must weigh not less than $1\frac{3}{4}$ oz., and thereafter not less than 2 oz.

The eggs laid by the prize-winning birds were practically all first-grade, as was the case last year. Some high scores were recorded. In the 122 days of the test, a White Leghorn, eight Australorps, and a Rhode Island Red, each laid 100 first-grade eggs or more, and in all classes of the competition 27 other birds each laid 90 first-grade eggs or more. The highest number of first-grade eggs laid by a bird in all classes of the competition was recorded by a White Leghorn entered by Mr. O. Scott. This bird laid 108 first-grade eggs in the 122 days.

### *Individual Birds—Single Test*

In the class for White Leghorns fed on wet mash, as stated earlier Mr. O. Scott won first prize with a bird that laid 108 first-grade eggs. Mr. B. J. Neenan gained second prize with a bird that laid 98 eggs, and Mr. J. Armstrong's entry was third with 96 eggs.

In the White Leghorn class, fed on dry mash, first prize went to a bird entered by Mr. G. McDonnell with a total of 99 eggs, all first grade. Mr. K. C. McKenzie gained second prize with a bird that laid 95 eggs, and Mr. F. W. Becker's bird was third with 93 eggs.

In the class for Australorps, Mr. C. E. Graham won first prize with a bird that laid 106 first-grade eggs. Equal second prizes were awarded to Messrs. A. and L. Caspar, and Mr. C. E. Graham, each of their birds having laid 104 eggs.

Mr. H. L. Chalmers obtained first prize in the class for Rhode Island Reds, with a bird that laid 105 first-grade eggs. Mr. J. W. Hattwell's bird gained second prize with a total of 99 eggs,

and equal third prizes were awarded to Messrs. F. G. Fereday, and R. H. Woods, each of their birds having laid 95 eggs.

First prize in the class for all Heavy Breeds, other than Australorps and Rhode Island Reds, was awarded to Mr. J. W. Hattwell, whose Langshan laid 86 eggs, all first grade. Mr. L. Gough gained second prize with a Light Sussex that laid 76 eggs, and A. E. C. Roberts secured third prize with a Light Sussex that laid 71 eggs.

# Winter Test Prize List, 1945-46

## INDIVIDUAL BIRDS—SINGLE TEST

| Pen No. | Name and Address. | Total Eggs. | Under-weight. | First Grade Eggs. |
|---|---|---|---|---|
| | **Class 1.—White Leghorns—Wet Mash.** | | | |
| | First Prize—Champion Certificate. | | | |
| 173 | O. Scott, Fawkner-street, Broadmeadows | 108 | .. | 108 |
| | Second Prize—Government Certificate. | | | |
| 154 | B. J. Neenan, 19 Carween-avenue, Mitcham | 99 | 1 | 98 |
| | Third Prize—Government Certificate. | | | |
| 106 | J. Armstrong, 657 Bell-street, West Preston, N.18 | 96 | .. | 96 |
| | **Class 2.—White Leghorns—Dry Mash.** | | | |
| | First Prize—Champion Certificate. | | | |
| 210 | G. McDonnell, 46 Childers-street, Kew, E.4 | 99 | .. | 99 |
| | Second Prize—Government Certificate. | | | |
| 204 | K. C. McKenzie, 82 Clarence-street, Geelong West | 96 | 1 | 95 |
| | Third Prize—Government Certificate. | | | |
| 189 | F. W. Becker, Follett-road, Cheltenham, S.22 | 93 | .. | 93 |
| | **Class 4.—Australorps—Wet Mash.** | | | |
| | First Prize—Champion Certificate. | | | |
| 17 | C. E. Graham, Portarlington | 106 | .. | 106 |
| | Equal Second Prize—Government Certificate. | | | |
| 5 | A. and L. Caspar, Main-street, Bacchus Marsh | 110 | 6 | 104 |
| | Equal Second Prize—Government Certificate. | | | |
| 18 | C. E. Graham, Portarlington | 104 | .. | 104 |
| | **Class 5.—Rhode Island Reds—Wet Mash.** | | | |
| | First Prize—Champion Certificate. | | | |
| 71 | H. L. Chalmers, 9 Lefevre-street, Spotswood, W.14 | 111 | 6 | 105 |
| | Second Prize—Government Certificate. | | | |
| 79 | J. W. Hattwell, Springvale-road, Glen Waverley | 99 | .. | 99 |
| | Equal Third Prize—Government Certificate. | | | |
| 74 | F. G. Fereday, 4 Ross-street, Northcote, N.16 | 95 | .. | 95 |
| | Equal Third Prize—Government Certificate. | | | |
| 94 | R. H. Woods, "Nestor," Fewster-road, Hampton, S.7 | 95 | .. | 95 |
| | **Class 5.—All Heavy Breeds, other than Australorps and Rhode Island Reds—Wet Mash.** | | | |
| | First Prize—Champion Certificate. | | | |
| 59 | J. W. Hattwell, Springvale-road, Glen Waverley (Langshan) | 86 | .. | 86 |
| | Second Prize—Government Certificate. | | | |
| 62 | L. Gough, 6 Clive-street, East Brighton, S.6 (Light Sussex) | 76 | .. | 76 |
| | Third Prize—Government Certificate. | | | |
| 63 | A. E. C. Roberts, "Range View," Launching Place (Light Sussex) | 77 | 6 | 71 |

# IN THE ORCHARD

By G. W. GAYFORD, B.Agr.Sc., Horticultural Instructor

### *Black Spot on Apples*

IT is a number of years now since there was a really serious outbreak of black spot in apple orchards. Although most apple growers spray regularly as a preventive measure against this disease, it must be admitted that the very dry seasons experienced during the past few years have been of some value in helping to retard the spread of this disease. In some districts, such as Portland, where the weather during the spring months is usually wetter than in other parts of the State, recent outbreaks of black spot have proved difficult to control.

Apple blossom buds showing "green tip" stage. The bud scales have separated from the majority of the fruit buds and the tips of the green folded leaves are just visible.

Weather conditions during the period when the developing buds of apple trees are susceptible to attack cannot be forecasted with sufficient accuracy to allow any relaxation in the necessary control measures. Spraying can be looked upon as a good insurance against loss from black spot and therefore should be done as thoroughly as possible. Another practice which will assist in preventing damage is to stop ploughing during the blossoming period. Spring infection results from the discharge of spores from old infected leaves lying on the ground, and if it is not possible to plough before blossoming, this operation should be delayed, because by stirring the leaves during this critical period, the discharge of spores is considerably increased.

### *Spray Programme*

For varieties which are susceptible to russet, i.e., Jonathan, London Pippin, Yates, Rokewood, Gravenstein, the following programme may be used :—

At the "green tip" stage (when the blossom buds and green tips of the leaves can be seen within the opening bud scales) apply Bordeaux mixture, strength 6 : 4 : 40. The Jonathan variety should receive this spray at an early stage, i.e., when the opening buds are just tipped with green. No further sprays containing copper should be applied to the above varieties. The next spray, lime sulphur, strength 2¼ gallons in 80, should be applied when the majority of the buds are showing pink petals while about 10 per cent. are in full bloom. Spray again with lime sulphur, 1½ gallons in 80, when the majority of the petals have fallen.

"Early pink" stage of apple blossom.

For varieties which do not russet so readily, the "green tip" Bordeaux spray may be followed by another, strength 3 : 3 : 50, at the finger stage, i.e., when the blossom buds are beginning to separate in the cluster but before any petals appear.

At a period of from 10 to 14

days after petal fall a further lime sulphur spray, strength 1 gallon in 80, should be applied.

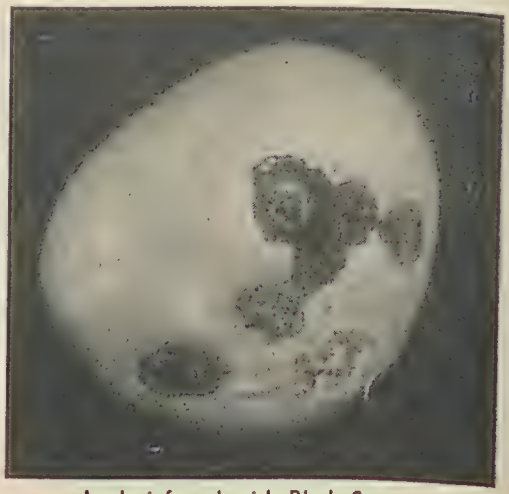
Most growers may desire to mix the lime sulphur with lead arsenate for the petal fall and later sprays. Where these two sprays are mixed, the lime sulphur should be diluted in the vat and 3 lb. of slaked lime added before adding the lead arsenate. This mixed spray should not be allowed to stand in the vat and should not be applied on a dull day when the trees dry out slowly after spraying.

### *Control your Apple Crop*

The coming season's crop promises to be very heavy and with labour still short on many orchards, some growers may consider using sprays to remove the blossom from portion of their orchard, thus allowing more time to be spent in caring for the rest of the property. The tendency for trees to bear heavy crops in alternate years seems to have increased and several growers have successfully and profitably used blossom-removal sprays during the heavy blossoming of 1943. As a result, a good yield was obtained last season when the apple crop generally was light.

Three materials may be used successfully to remove the blossom from fruit trees; cresylic acid, tar distillate or sprays containing D.N.C. The best time to spray is when 20 to 50 per cent. of the flower buds are in full bloom.

D.N.C. sprays should be used at the rate of 2 gallons in 100 while tar distillate should be used at the rate of 3 gallons in 100. Cresylic acid may be prepared as follows:—Dissolve 3 lb. soft soap in 2 gallons of hot water, add slowly one gallon of cresylic acid and stir rapidly. This



Apple infected with Black Spot.

mixture added to 97 gallons of water will make a 1 per cent. solution and would be effective for most apple varieties, but for the varieties Yates, London Pippin, Jonathan, Rokewood, Statesman, and Gravenstein, the strength should be increased to 1¼ per cent.

Trees which are to be sprayed to remove blossoms should be protected against black spot by the usual pre-blossom sprays.

# GIFT PARCELS FOR THE UNITED KINGDOM

For many years prior to the war the Victorian Department of Agriculture sponsored a scheme under which gift parcels of Victorian grown foodstuffs including carcasses of lamb, canned and dried fruits, fresh apples and pears, jam, wine and butter could be forwarded to relations and friends in Great Britain. This scheme was continued during the war, although owing to the limited shipping space parcels were restricted to a weight of 5 lb. Many thousands of these parcels have been despatched, and although small have been very welcome to the severely rationed people of Britain. The gift scheme is being continued this year, and the Department of Agriculture has arranged for the despatch of 20,000 small parcels each of 5 lb. weight conforming to the conditions laid down by the British Authorities.

The parcel will contain mixed dried fruits, raisins, honey, cheese and meat.

The cost of the parcel including packing, postage, &c., will be ten shillings (10s.) for delivery to civilians and seven shillings and sixpence (7s. 6d.) for delivery to members of the oversea forces in the United Kingdom, provided the full Service address can be given.

Orders will be accepted until further notice for despatch at donor's own risk to any address in England, Wales, Scotland, and Northern Ireland, and should be forwarded together with the necessary remittance to the Director of Agriculture, Public Offices, Melbourne, C.2.

Orders for parcels to residents in Eire (Irish Free State) cannot be accepted because of the heavy customs duty in that country.

One order only will be accepted at one time for each recipient.

# THE FLOWER GARDEN

By J. L. Provan, B.Agr.Sc., Principal, School of Horticulture, Burnley Gardens

### *Preparing for the Summer Display*

SOWING seeds and planting will keep the gardener busy this month. Weeding, and the control of insect pests and diseases are other operations which will need attention.

Seeds of the following popular plants may be sown in seed beds or seed boxes now :—Ageratum, antirrhinum, aster, carnation, celosia, delphinium dianthus, gaillardia, geum, lupin, marigold, petunia, phlox, and scabious. Plant out such perennials as gladiolus, agapanthus, valotta, canna, begonia, pentstemon, aster, and phlox. Do not cover the seed with more than ¼ inch of soil, and if the soil used for covering is of a light sandy type, and contains plenty of organic matter, it will not "cake" on the surface. It is preferable to sieve it before use. This is most conveniently done by sieving the soil over the seed after sowing. Seed boxes should be 4 to 6 inches deep and made of wood, and holes or slits should be provided in the bottom for drainage. A convenient size for these boxes is 18 inches to 2 ft. square. Clinker ash, coarse gravel, broken crocks or charcoal should be placed over the bottom of the box.

The soil used for raising the seedlings should be of a loamy nature, with the addition of well-rotted animal manure or leaf mould mixed through it. If the soil mixture cakes together when pressed tightly in the hand, add some sand to it until this caking effect is overcome. After placing in the seed boxes the soil should be pressed down to make a firm seed-bed. Glass may be used to cover the boxes, but this should be removed as soon as the seedlings appear. Remember when sowing the seed to sow it thinly and so avoid crowded, weak, spindly plants. The weak, spindly type of plant never transplants satisfactorily and is prone to disease.

The following plants are usually sown where they are to remain :—Nasturtium, nigella, eschscholtzia, portulaca, gypsophila, mignonette, alyssum, and nemophila.

Nigella, mignonette, and nemophila require cool, moist, partially shaded places in the garden to grow to perfection. Nasturtiums flower best in a fairly dry situation, but should have partial shade during the hot summer months. Eschscholtzia and portulaca may be sown in open, hot situations and will grow reasonably well in gravelly or stony soils.

### *Perennials*

The term "perennials" includes all plants such as trees, shrubs, bulbs, &c., which persist for more than two years. When the average gardener

An attractive clump of Russell lupines.

speaks of perennials, however, he usually means the hardy herbaceous perennials, or those plants which send up more or less soft green stems each spring and summer, which flower, set seed, and then die down. Sometimes a small rosette of leaves is formed on the surface of the soil, or thick fleshy stems or roots, which contain dormant buds, persist beneath the soil to carry the plant over from season to season. Here are some of the more popular perennial plants :—Perennial asters (Easter daisies), cannas, helenium, rudbeckia, delphiniums, Russell lupines, kniphofia, and perennial phlox. Usually these herbaceous perennial plants can remain in the same situation for two seasons, but after that period it is advisable to lift them, divide the plant, remove the old portions, and

replant the younger portions of the plant. The best time to do this is when the plant has commenced to grow in the spring, because the wounds caused by dividing the plant heal quickly at this time and there is less likelihood of losing portions of the plant by rotting. If the plants are allowed to grow in the same position for several years the clumps become large and over-crowded and the quantity and quality of the flowers deteriorate.

### *Aphis*

The young shoots of roses and peach trees are particularly subject to aphis infection during the spring. As soon as an infestation is noticed steps should be taken to control it, because the aphis multiplies so rapidly that it may do a large amount of damage if control is neglected. Spray with nicotine sulphate 1 : 600, plus a small amount of soft soap, when aphis is visible, paying particular attention to any curly foliage which may shelter the insects from the spray. Summer white oil emulsion 1 : 40 is also useful if nicotine sulphate is unobtainable.

## *THE VEGETABLE GARDEN*

### *Broccoli*

Seed of *Green Sprouting* Broccoli may be sown in seed-beds or seed-boxes this month. Cover the seed with ¼ inch of fine sandy soil. This vegetable is becoming more popular in home gardens because housewives can cut the small cauliflower-like heads and allow the plant to remain in the garden bed to produce more heads at a later date. It is a fairly hardy type of vegetable and can stand cold conditions, but like all its relatives, it will require constant protection from the cabbage moth and cabbage white butterfly. Spraying or dusting with arsenate of lead at intervals of 10 to 14 days will be necessary.

### *Spinach*

Spinach is one of those quick-maturing crops which provides a valuable green vegetable in the spring. The *Round Seeded* or summer variety should be sown now in drills or rows in the beds where they are to remain. Space these drills about 18 inches apart and sow about ten seeds per foot. Gently press the seed into the soil and cover with about ½ inch of fine sandy soil. To be successful in growing spinach the soil must be rich and well-drained. As soon as the young plants are large enough to handle, they must be thinned out to about 6 inches apart. During growth give the plants an occasional watering with nitrate of soda, at the rate of 1 oz. to 1 gallon of water. This will stimulate growth and promote a good green colour. It is preferable that this watering should be done while the soil is moist, and care should be taken not to water the foliage.

### *New Zealand Spinach*

For a summer green, the young thick fleshy leaves of *New Zealand Spinach* are very useful. The tips of this plant are picked and cooked in the same way as other green vegetables. Several clumps of this vegetable in the garden will provide sufficient greens for the average-sized family. It should be planted in an open sunny situation. A few seeds sown together in mounds, or hills as they are called, each 3 ft. apart, will usually give some nice clumps of this vegetable. The plant requires plenty of water during the summer.

### *Lettuce*

Another sowing of *Iceberg* lettuce can be made in seed-beds or seed-boxes this month. Cover the seed with fine soil to a depth of not more than ½ inch. This is a crop which should be sown regularly at 4 to 6 weekly intervals, in order to ensure a succession. Sow only small quantities of seed at each time, because lettuce is one of those crops which must be used when mature, otherwise it deteriorates.

### *Peas and Tomatoes*

Further sowings of peas and tomatoes can be made if required, and particulars of these crops will be found in the August issue of this Journal. *Tatura Dwarf Globe* and *Red Marhio* tomato seed may be sown now. These varieties are usually referred to as "second early" tomatoes and are particularly good for home gardens.

### *Parsnip*

If sowings were not made last month, *Hollow Crown* parsnip seed can be sown now in drills in the beds where they are to remain. Space the drills 24 inches apart and cover the seed with ½ inch of soil. To be successful with parsnips the soil should be dug very deeply and broken into a fine tilth before the seed is sown.

### *Red Beet and Turnips*

Seed of *Detroit Dark Red* and *Crimson Globe* red beet, or *White Stone* and *Purple Top Munich* turnips can be sown this month in drills 18 inches apart, covering the seed to a depth of about ½ inch.

### *Potatoes*

A further planting of early varieties of potatoes may be made this month. Space the rows 24 inches apart and allow 14 inches between the plants. Each piece of "seed" potato should be about 2 oz. in weight, and planted to a depth of 4½ to 5 inches. When cutting large potatoes for seed, each piece should be about 2 oz. in weight and contain at least one good "eye".

# FRUIT SPRAYING GUIDE *for the* HOME GARDENER

Compiled by—
T. H. KNEEN, B.Agr.Sc., Senior Horticultural Instructor,
and G. W. GAYFORD, B.Agr.Sc., Horticultural Instructor

Here are the main insect pests and diseases of fruits commonly grown in the home garden, listed in convenient, quick reference form, together with their symptoms and treatment. If the reader is uncertain as to what pest or disease is attacking his plants he is invited to send specimens to the Department of Agriculture for identification. It is well to remember that most sprays are preventive and, therefore, once the symptoms appear, it may not be possible to control the pest or disease. For effective spraying, a stirrup or bucket pump is required. For several trees, a knapsack pump is more efficient. Finally, thoroughness and correct timing are the essentials to success.

| Insect Pest or Disease. | Fruit. | Symptoms. | Treatment. |
|---|---|---|---|
| ***1. All Deciduous Fruit Trees and Vines.*** | | | |
| Scale insects (Apple Mussel, San José, Vine Scale, &c.) | Deciduous fruit trees and vines | Small, round or oval caps attached to twigs and limbs of trees | Red oil, 2 pts./4 gals. or lime sulphur, 2⅔ pts./4 gals.—June–August |
| Red spider, Bryobia mite | Deciduous fruit trees and vines | Tiny red-legged, brown-bodied insects appear on leaves in summer. Clusters of red eggs under twigs | Red oil, 2 pts./4 gals. or lime sulphur, 2⅔ pts./4 gals.—June–August |
| ***2. Pome Fruits—Apples, Pears, Quinces.*** | | | |
| Codling moth .. | Apples, pears and quinces | Holes in fruit surrounded by brown granules | Lead arsenate powder, 2 oz./4 gals. water. Spray at petal fall and thereafter at three-weekly intervals until harvest |
| Black spot .. .. | Apples .. .. | Black spots on surface of leaves and fruit | Bordeaux mixture (Note A*) when buds are opening<br>Lime sulphur, 1 pt./4 gals. when 5 per cent. blossoms open<br>Lime sulphur, ¾ pt./4 gals. when 80 per cent. petals have fallen. Later sprays lime sulphur, ½ pt./4 gals. |
| Black spot .. .. | Pears .. .. | Black spots on leaves and fruit | Bordeaux mixture (Note A*) at bud burst and when blossom buds separate in cluster. Half strength Bordeaux mixture at petal fall. Apply only first Bordeaux spray to Josephine and Winter Cole varieties |
| Woolly aphis .. | Apples .. .. | Clusters of small black insects covered with white sticky threads | Normally controlled by a parasitic wasp. When infestation severe, use red oil, 2 pts./4 gals. in winter. Use forcing spray |

* See Note page 402

| Insect Pest or Disease. | Fruit. | Symptoms. | Treatment. |
|---|---|---|---|
| **2. *Pome Fruits—Apples, Pears, Quinces—continued.*** | | | |
| Pear and cherry slug.. | Pears and quinces .. | Slimy slugs eat surface of leaf, leaving brown patches | Lead arsenate powder, 2 oz./4 gals. water |
| Leaf variegation .. | Apples .. .. | Mottled yellow patches on leaves | No control—does not affect productivity of trees |
| Pear leaf blister mite | Pears .. .. | Small scattered, pale greenish blisters on young leaves, later turning dark brown or yellow | Lime sulphur, 3¼ pts./4 gals. Just before buds swell in late winter. This spray effective for pests in Group 1 |
| **3. *Stone Fruits—Peaches, Nectarines, Apricots, Plums, Cherries, Almonds.*** | | | |
| Green peach aphid and and black cherry aphid | Peach and cherry trees | Small green insects clustered thickly on new growth of peaches causing leaves to curl. Small brown and black insects on new growth of cherries | Tar distillate, or D.N.C. Winter Washes, 1 pt./4 gals. Before mid-July to kill eggs |
| Black peach aphid and other aphids on trees during spring and summer | Peach trees, &c. .. | Small black or green insects clustered on leaves of trees | Nicotine sulphate, 1 fl. oz./4 gals. plus 2 oz. soap, as soon as aphids are noticed |
| Shot hole or scab .. | Apricots, plums, almonds, peaches | Small holes in leaves. Apricots covered with small round black scabs. Gum spots on peach twigs | Bordeaux mixture (see Note A*) at "pink bud" stage in spring and when leaves fall in autumn |
| Leaf curl .. .. | Peaches and nectarines | Leaves curl and thicken. Thickened part becomes red and covered with greyish powder | Bordeaux mixture (see Note A*) at "pink bud" stage |
| Brown rot .. .. | All stone fruit .. | *Blossom blight.*—Flowers wilt, turn brown and become covered with brown powder<br>*Fruit.*—Circular patch of soft brown rot which becomes covered with brown powder<br>*Twigs.*—Brown decayed patches | Bordeaux mixture at "pink bud" stage (Note A*).<br>*Cherries.*—Lime sulphur ¼ pt./4 gals. water, fruit ½–½ grown<br>*Peaches.*—½ lb. sulphur, ½ lb. limil plus ½ oz. spreader in 4 gals. water. Apply at monthly intervals from October<br>*No* post-blossom sprays of sulphur or copper can be applied to apricots. Remove and destroy all infected fruit ("mummies") on ground or sticking in tree. Remove decayed twigs |
| Peach rust .. .. | Peaches .. .. | Small yellow spots on upper surface of leaves. Raised brown pustules discharging spores on underside; circular green depressions in fruit | Treat as for brown rot on peaches |
| Pear and cherry slug.. | Cherries and plums.. | Slimy slugs eat surface of leaf, leaving brown patches | Lead arsenate powder, 2 oz./4 gals. water |

* See Note page 402

| Insect Pest or Disease. | Fruit. | Symptoms. | Treatment. |
|---|---|---|---|
| **4. *Citrus Fruits—Oranges, Lemons, &c.*** | | | |
| Scale insects (various) | Citrus .. .. | Red, brown or black scales on skins, leaves and fruit | White or red oil emulsion, ¾ pt./4 gals. mid December and mid March. May be combined with Bordeaux sprays but do not use oil immediately following the Bordeaux spray |
| Sooty mould .. | Citrus .. .. | Dense black powder on leaves and fruit | Associated with scale insects; use Bordeaux mixture (½ strength combined with oil spray for scale) |
| Bacterial pit .. | Lemons .. .. | Sunken black areas ½ to ¾ inch diameter in skin of fruit | Bordeaux mixture, ½ strength (Note A*) autumn and spring |
| Septoria Spot and anthracnose | Citrus .. .. | Small to large dark brown spots in skin of fruit | Bordeaux mixture, ½ strength (Note A*) in autumn |
| Collar rot .. .. | Citrus .. .. | Bark of trunk near ground level dies, later dries out and splits. Usually accompanied by copious development of gum | Ensure good soil drainage. Cut away dead tissue with sharp knife, exposing tops of main roots if necessary. Paint area with Bordeaux paste (Note A*) |
| Mottle leaf (zinc deficiency) | Citrus .. .. | Leaf mottled, area along midrib and veins normal, remainder light yellow to white | Zinc sulphate, 2 oz. plus hydrated lime, 1 oz./4 gals. water September or March |
| **5. *Grape Vines.*** | | | |
| Downy mildew .. | Vines .. .. | Brown areas on leaves. Fruit clusters become rotten and covered with downy fungus | Bordeaux mixture (Note A*)—<br>(1) Early October<br>(2) Late October<br>(3) January |
| Erinose .. .. | Vines .. .. | Raised lumps on leaves, hairy on undersides | Lime sulphur, 3 pts./4 gals. water just before bud burst |
| Vine moth .. .. | Vines .. .. | Caterpillars, dark green with yellowish markings—eat leaves from edge | Lead arsenate powder, 2 oz./4 gals. water |
| Black spot (Anthracnose) | Vines .. .. | Purplish black spots on leaves, canes and fruit | Double strength Bordeaux mixture (Note A*) at bud burst and ordinary strength before blooming and after setting. In winter, swab vines with 13 oz. sulphuric acid poured over 2 lb. iron sulphate, dissolved in 1 gal. water in non-metallic vessel |

* See Note page 402.

| Insect Pest or Disease. | Fruit. | Symptoms. | Treatment. |
|---|---|---|---|
| | | *6. Walnuts.* | |
| Black spot .. .. | Walnuts .. .. | Black spots on leaves and nuts | Control difficult. Bordeaux mixture in spring at 2 to 3-weekly intervals may reduce infection |
| Erinose .. .. | Walnuts .. .. | Raised lumps on leaves, hairy on undersides | Lime sulphur, 3 pts./4 gals. water just before bud burst |
| | | *7. Passion Fruit* | |
| Brown spot .. .. | Passion fruit .. | Brown areas on leaves and spots on fruit | ½ strength Bordeaux mixture (Note A) in spring and early summer |
| Woodiness .. .. | Passion fruit .. | Fruits hard and woody. Leaves small, mottled and distorted | No controls. Remove and burn affected vines |
| | | *8. Currants.* | |
| Currant borer moth .. | Currants .. .. | Caterpillars bore into young canes. Plants become sickly and foliage yellowed and dwarfed | In early spring cut out affected canes at ground level and burn |

### *Note A.*

*Normal strength Bordeaux mixture* may be made as follows:—Dissolve 9 oz. copper sulphate (bluestone) crystals in 2 gallons of water contained in a non-metallic vessel. Mix 9 oz. slaked lime or limil in another 2 gallons of water and combine these two solutions. For different strengths, vary weights of materials, but keep volume the same.

Prepared Bordeaux may be purchased. Copper oxychloride may also be used as a substitute.

*Bordeaux Paste* may be prepared by mixing equal parts of copper sulphate and slaked lime with water to make a creamy paste.

### *Note B.*

*Some Handy Measures—*

3 teaspoons = 1 tablespoon
2 tablespoons = 1 fluid ounce
7 fluid ounces = 1 cupful
20 fluid ounces = 1 pint
8 pints = 1 gallon
1 gallon water weighs 10 lb.
½ cup lead arsenate powder weighs approximately 2 oz.

### *Note C.*

*Do not mix—*

Lead arsenate and soap.
Bordeaux mixture and soap.
Lime sulphur and soap; lime sulphur and white oil as a summer spray.

of Standard Herd Test history. This is shown by her ten-year average of 569 lb. butterfat. "Bonnie Lass 2nd" is owned by the Estate of the late F. A. Willams of Bamawm Extension. Her average yield to date for five lactations is 609 lb. butterfat.

"Victoria Rita," mature Friesian from the Werribee herd of the Department of Agriculture, produced 602 lb. butterfat.

An equally well-known herd-test cow to miss the Reserve position is "Mer Vue Sister", owned by Mr. F. W. Clarke of Toora. This cow led the State as a junior two, a junior three, and a junior four-year-old—a performance rarely equalled. "Mer Vue Sister" represents a famous trio of full sisters that exceeded the 500 lb. level of butterfat before reaching mature form. Each tested over 6 per cent., and each has at least one daughter that possesses the high average test of the family. Their dam, "Hazelgrange Mistress", one of the really great cows of the breed, also achieved high production records. The present herd sire, "Mer Vue Jupiter", has nearly twenty daughters that have tested over 6 per cent. They include the two full sisters "Mer Vue Choice Variety 2nd." and "Choice Variety 3rd.", their average test being over 7 per cent. The first-named had the exceedingly high average test of 7·92 per cent. with her second calf yield of 512 lb. She also appears among the 600 lb. butterfat cows in this report with a 7·28 per cent. test.

Mr. Clarke chose "Jupiter" for his herd-sire because of the high test of his dam "Mer Vue Joy", (twice over 6·7 per cent.). This cow is one of the three full sisters mentioned. "Mer Vue Sister's" yield of 12,403 lb. of milk and 694 lb. of butterfat has considerable merit. This cow has the added distinction of representing a family that is breeding on in no uncertain manner. Her average yield to date is 608 lb. butterfat.

### *Leading Six Cows in each of the Age Classes*

With the exception of two Friesians from the Werribee Research Farm, all of the 20 cows that produced over 600 lb. butterfat, as well as the 42 animals in the seven classes, are either Guernseys or Jerseys. An unusual feature of the "over 600 lb." group is the presence of six members of the "Yarraview" Guernsey stud. They include "Roulette" (second in the senior four-year-old class) with 670·6 lb. butterfat and "Rougette" which broke the breed milk record of Australia as a cow on her second calf. The high average yield of 620 lb. butterfat for the eight mature cows of this herd is materially assisted by this year's champion and the extraordinary yield of 963·4 lb. butterfat by "Yarraview Le Mode", which is only 14 lb. lower than her previous figure. Messrs. Jackson, Maloney, Chirnside and Clarke each have two or more cows in the "over 600 lb." group.

"Elm Grove Orchid 2nd" is an unusual cow, in that her sire "Gold Star of Melrose", was born in 1923. Sires rarely remain fertile or even live to the age of nineteen, as was the case with "Gold Star", which sired many good daughters at "Elm Grove".

Mr. Jackson's cows "Surrey Buttercup 15th"—the leader of the junior four-year-old class, and "Milvue Aim's Coronation", the leader of the senior-threes; also "Pine Ridge Countess 3rd", are likely to be heard of again, for they are under good management, and are still young cows.

Mr. Maloney's "Belgonia Suspense 10th" and "Junette 13th"; also "Junette 15th", the leader of the senior two-year-old class, are high-yielding young cows bound to be heard of again, for their best yields should still be ahead of them.

Although the "Mornmoot" herd with eight Standard Herd Test Championships behind it, has receded to third position this year, the excellent yields of nine representatives in the "best six" classes, indicate its potential championship form. "Mornmoot Princess Madeira 21st"—a 634 lb. butterfat cow— is a

twin sister to "Princess Madeira 20th" which was listed last year as a 552 lb. junior four-year-old. "Madeira 9th", a full sister to the twins, has yielded up to 652 lb. butterfat. Their dam is "Princess Madeira 3rd"—the cow which topped the Standard Test in 1938-39, and has produced over 700 lb. butterfat on three occasions.

Others among the nine "classified" cows in this report, are "Werribee Twilight 3rd", second as a junior four-year-old with 618 lb. butterfat; "Mornmoot Fancy Starbright 9th" which occupies a similar position in the junior-three-year-old class with a 543 lb. yield; and also "Mornmoot Princess Madeira 23rd" with a 498 lb. yield.

"Windrest Island Star 2nd" with 634 lb. as a junior three-year-old represents Dr. A. R. Haywood's "Windrest" stud; while the 602 lb. yield of "Victoria Rita", and the 546 lb. effort of "Victoria Madeline"—sixth in the junior four-year-old class—are the sole representatives of the Friesian breed in the classes. Messrs. G. A. McNabb and Son, Mrs. A. A. Dennis, Mr. J. O'Neill, Messrs. H. W. Waterhouse and Son, Mr. R. H. Mitchell and Mr. R. B. Hardie, are all Jersey breeders whose herds are represented.

The Standard Herd Test Records for the quarter ended 30th June, 1945, will be included in the Standard Herd Test booklet to be published towards the end of September. Copies of this booklet may be obtained after 1st October from the Superintendent of Dairying, Department of Agriculture, Melbourne, C.2.

## Cows Exceeding 500 lb. Butterfat.

| Class. | 900 to 1000 lb. | 800 to 900 lb. | 700 to 800 lb. | 600 to 700 lb. | 500 to 600 lb. | Total. |
|---|---|---|---|---|---|---|
| Mature .. | 1 | .. | 1 | 9 | 59 | 70 |
| Senior 4 .. | .. | .. | .. | 4 | 9 | 13 |
| Junior 4 .. | .. | .. | .. | 2 | 9 | 11 |
| Senior 3 .. | .. | .. | .. | 2 | 7 | 9 |
| Junior 3 .. | .. | .. | .. | 1 | 10 | 11 |
| Senior 2 .. | .. | .. | .. | .. | 3 | 3 |
| Junior 2 .. | .. | .. | .. | .. | .. | .. |
| Total .. | 1 | .. | 1 | 18 | 97 | 117* |
| Previous Year's Totals | 1 | 1 | 1 | 5 | 77 | 85* |

* Grand totals.

## Averages—1944-45.—273 Days Lactation Period.

| Class. | Number of Records. | Average Butterfat without Allowances. | Average Butterfat with Allowances. |
|---|---|---|---|
| | | lb. | lb. |
| Mature .. .. | 702 | 368 | .. |
| Senior 4-year-old .. | 160 | 365 | 385 |
| Junior 4-year-old .. | 197 | 349 | 389 |
| Senior 3-year-old .. | 183 | 336 | 396 |
| Junior 3-year-old .. | 230 | 319 | 399 |
| Senior 2-year-old .. | 216 | 302 | 402 |
| Junior 2-year-old .. | 495 | 288 | 408 |
| Total .. | 2,183 | .. | .. |

Average all Classes without Allowances. 334 lb. butterfat.
Average all Classes with Allowances. 389 lb. butterfat.

## List of Cows, 600 lb. Butterfat or Over.

| Name of Cow. | Owner. | Class. | Breed. | Butterfat. |
|---|---|---|---|---|
| | | | | lb. |
| Yarraview Lo Mode .. .. | Payne, A. E. T. .. .. | Mature .. | Guernsey | 963·4 |
| Yarraview Siren .. .. | Payne, A. E. T. .. .. | ,, .. | ,, | 715·9 |
| Bamawm Bonnie Lass 2nd .. | Williams, Estate of the late F. A. | ,, .. | Jersey .. | 698·6 |
| Mer Vue Sister .. .. .. | Clarke, F. W. .. .. .. | ,, .. | ,, .. | 693·7 |
| Jindivick Heroine 16th .. .. | Ronalds, O., and Son .. .. | Senior 4 .. | ,, .. | 674·9 |
| Yarraview Roulette .. .. | Payne, A. E. T. .. .. | ,, .. | Guernsey | 670·6 |
| Yarraview Rougette .. .. | Payne, A. E. T. .. .. | Mature .. | ,, | 656·0 |
| Surrey Buttercup 15th .. .. | Jackson, H. .. .. .. | Junior 4 .. | Jersey .. | 649·2 |
| Milvue Aim's Coronation .. .. | Jackson, H. .. .. .. | Senior 3 .. | ,, .. | 644·6 |
| Mornmoot Princess Madeira 21st .. | Chirnside, R. M. .. .. | Mature .. | ,, .. | 634·4 |
| Windrest Island Star 2nd .. | Haywood, Dr. A. R. .. .. | Junior 3 .. | ,, .. | 634·2 |
| Elm Grove Orchid 2nd .. .. | Gay, W. C. R. .. .. .. | Senior 4 .. | ,, .. | 630·6 |
| Yarraview Teeny .. .. | Payne, A. E. T. .. .. | Mature .. | Guernsey | 623·2 |
| Pine Ridge Countess 3rd .. .. | Jackson, H. .. .. .. | ,, .. | Jersey .. | 621·8 |
| Werribee Twilight 3rd .. .. | Chirnside, R. M. .. .. | Junior 4 .. | ,, .. | 617·6 |
| Yarraview Essie .. .. .. | Payne, A. E. T. .. .. | Mature .. | Guernsey | 613·8 |
| Belgonia Suspense 10th .. .. | Maloney, P. J. .. .. .. | ,, .. | Jersey .. | 609·6 |
| Mer Vue Choice Variety 2nd .. | Clarke, F. W. .. .. .. | Senior 4 .. | ,, .. | 609·2 |
| Belgonia Junette 13th .. .. | Maloney, P. J. .. .. .. | Senior 3 .. | ,, .. | 604·5 |
| Victoria Rita .. .. .. | Department of Agriculture .. | Mature .. | Friesian .. | 602·3 |

## The Six Leading Cows in Each Section.

| Name of Cow. | Owner. | Class. | Breed. | Butterfat. |
|---|---|---|---|---|
| | | | | lb. |
| Yarraview Le Mode | Payne, A. E. T. | Mature | Guernsey | 963·4 |
| Yarraview Siren | Payne, A. E. T. | ,, | ,, | 715·9 |
| Bamawm Bonnie Lass 2nd | Williams, Estate of the late F. A. | ,, | Jersey | 698·6 |
| Mer Vue Sister | Clarke, F. W. | ,, | ,, | 693·7 |
| Yarraview Rougette | Payne, A. E. T. | ,, | Guernsey | 656·0 |
| Mornmoot Princess Madeira 21st | Chirnside, R. M. | ,, | Jersey | 634·4 |
| Jindivick Heroine 16th | Ronalds, O., and Son | Senior 4 | Jersey | 674·9 |
| Yarraview Roulette | Payne, A. E .T. | ,, | Guernsey | 670·6 |
| Elm Grove Orchid 2nd | Gay, W. C. R. | ,, | Jersey | 630·6 |
| Mer Vue Choice Variety 2nd | Clarke, F. W. | ,, | ,, | 609·2 |
| Belgonia Junette 9th | Maloney, P. J. | ,, | ,, | 594·7 |
| Mornmoot Fancy Starbright 6th | Chirnside, R. M. | ,, | ,, | 593·8 |
| Surrey Buttercup 15th | Jackson, H. | Junior 4 | Jersey | 649·2 |
| Werribee Twilight 3rd | Chirnside, R. M. | ,, | ,, | 617·6 |
| Yarraview Chamois | Payne, A. E. T. | ,, | Guernsey | 592·5 |
| Maxon Graceful Duchess 5th | McNabb, G. A., and Son | ,, | Jersey | 590·9 |
| Werribee Alexia | Chirnside, R. M. | ,, | ,, | 588·8 |
| Victoria Madeline | Department of Agriculture | ,, | Friesian | 546·1 |
| Milvue Aim's Coronation | Jackson, H. | Senior 3 | Jersey | 644·6 |
| Belgonia Junette 13th | Maloney, P. J. | ,, | ,, | 604·5 |
| Mer Vue Wee Doris 4th | Clarke, F. W. | ,, | ,, | 581·6 |
| Ballam Sweet Lavender | Dennis, Mrs. A. A. | ,, | ,, | 548·3 |
| Belgonia Peggy 31st | Maloney, P. J. | ,, | ,, | 536·4 |
| Belgonia Junette 12th | Maloney, P. J. | ,, | ,, | 511·2 |
| Windrest Island Star 2nd | Haywood, Dr. A. R. | Junior 3 | Jersey | 634·2 |
| Mornmoot Fancy Starbright 9th | Chirnside, R. M. | ,, | ,, | 543·3 |
| Belgonia Eileen 15th | Maloney, P. J. | ,, | ,, | 541·2 |
| Clifford Farm Sandra | Mitchell, R. H. | ,, | ,, | 537·8 |
| Ullina Bonnie Pearl | O'Neill, J. | ,, | ,, | 537·2 |
| Mornmoot Satisfaction 10th | Chirnside, R. M. | ,, | ,, | 526·1 |
| Belgonia Junette 15th | Maloney, P. J. | Senior 2 | Jersey | 570·8 |
| Surrey Bonnie Madeira 12th | Jackson, H. | ,, | ,, | 551·2 |
| Surrey Buttercup 17th | Jackson, H. | ,, | ,, | 503·8 |
| Mornmoot Princess Madeira 23rd | Chirnside, R. M. | ,, | ,, | 498·4 |
| Ovalau Magnite | Waterhouse, H. W., and Son | ,, | ,, | 488·1 |
| Ballam Vera | Dennis, Mrs. A. A. | ,, | ,, | 482·6 |
| Vermont Lola | Stephens, Dr. F. G. | Junior 2 | Guernsey | 491·9 |
| Mornmoot Fancy Starbright 13th | Chirnside, R. M. | ,, | Jersey | 466·5 |
| Mornmoot Fame | Chirnside, R. M. | ,, | ,, | 458·8 |
| Elm Grove Laurette 5th | Gay, W. C. R. | ,, | ,, | 456·1 |
| Ballam Gay Ladybird | Dennis, Mrs. A. A. | ,, | ,, | 454·3 |
| Glen Urquhart Dandy Princess | Hardie, R. B. | ,, | ,, | 453·5 |

# HERD AVERAGES, 1944-45

| Owner. | Breed. | Junior 2-year-old. | | Senior 2-year-old. | | Junior 3-year-old. | | Senior 3-year-old. | | Junior 4-year-old. | | Senior 4-year-old. | | Mature. | | Total Herd. | Average without Allowances. | Average with Allowances. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | Average. | No. | Average. | No. | Average. | No. | Average. | No. | Average. | No. | Average. | No. | Average. | No. | lb. | lb. |
| | | | lb. | | lb. | | lb. | | lb. | | lb. | | lb. | | lb. | | | |
| **HERDS OF 25 COWS AND OVER.** | | | | | | | | | | | | | | | | | | |
| 1. Chirnside, R. M. | Jersey .. | 16 | 355·8 | 5 | 420·5 | 5 | 507·3 | 2 | 493·1 | 3 | 613·6 | 2 | 547·9 | 5 | 514·0 | 38 | 442·8 | 535·8 |
| 2. Payne, A. E. T. | Guernsey | 6 | 297·5 | 3 | 361·3 | 3 | 390·3 | 1 | 328·0 | 2 | 453·8 | 2 | 555·9 | 8 | 619·7 | 25 | 454·0 | 516·6 |
| 3. Haywood, Dr. A. R. | Jersey .. | 5 | 378·8 | 5 | 356·2 | 2 | 464·4 | 3 | 458·5 | 2 | 506·1 | 3 | 497·2 | 17 | 501·9 | 37 | 459·9 | 513·6 |
| 4. Clarke, F. W. .. | ,, .. | 9 | 344·7 | 4 | 352·5 | 2 | 390·4 | 5 | 485·5 | 5 | 407·4 | 5 | 423·4 | 7 | 478·0 | 37 | 411·4 | 482·9 |
| 5. Waterhouse, H. W., and Son | ,, .. | 12 | 331·5 | 3 | 445·5 | 2 | 366·7 | 1 | 453·0 | 1 | 440·4 | .. | .. | 12 | 426·3 | 31 | 388·9 | 461·4 |
| 6. Hore, E. .. | ,, .. | 8 | 307·6 | 3 | 368·2 | 3 | 376·7 | 4 | 432·5 | 10 | 397·0 | 2 | 393·8 | 7 | 407·7 | 37 | 379·4 | 449·3 |
| 7. Huffer, J. A. .. | ,, .. | 11 | 322·4 | 2 | 392·6 | .. | .. | 3 | 300·5 | 1 | 421·7 | 6 | 467·8 | 6 | 389·8 | 29 | 372·4 | 443·6 |
| 8. Vaughan Bros. | ,, .. | 10 | 356·5 | 1 | 296·7 | 3 | 310·0 | 1 | 421·6 | 6 | 406·6 | 1 | 411·4 | 3 | 320·2 | 25 | 361·0 | 440·4 |
| 9. Bennett, J. W. | ,, .. | 16 | 321·6 | 2 | 297·8 | 5 | 359·3 | .. | .. | 4 | 340·9 | 1 | 352·6 | 12 | 413·3 | 40 | 355·3 | 435·3 |
| 10. McNabb, G. A., and Son | ,, .. | 10 | 277·9 | 4 | 305·1 | 4 | 363·9 | 3 | 334·5 | 8 | 433·9 | 6 | 379·3 | 17 | 397·2 | 52 | 364·6 | 431·9 |
| 11. Harvey, T. .. | ,, .. | 7 | 326·9 | 3 | 357·3 | 2 | 427·4 | 5 | 375·2 | 4 | 365·2 | 3 | 340·6 | 13 | 397·7 | 37 | 371·5 | 431·7 |
| 12. Devon Park Stud Farm (G. S. Daley) | ,, .. | 10 | 341·1 | 1 | 344·5 | 4 | 372·5 | 5 | 324·1 | 5 | 392·0 | 2 | 432·1 | 12 | 376·5 | 39 | 364·3 | 431·7 |
| 13. Maher, R. H. .. | ,, .. | 20 | 268·5 | 3 | 398·9 | 5 | 360·4 | 5 | 349·2 | 2 | 377·0 | 6 | 410·9 | 12 | 409·5 | 53 | 344·3 | 431·2 |
| 14. Fairchild and Clutterbuck | ,, .. | 8 | 326·7 | 4 | 323·7 | 3 | 333·4 | 2 | 373·7 | 4 | 381·6 | 2 | 409·8 | 9 | 383·5 | 32 | 357·9 | 426·4 |
| 15. Bennett, R. H., and Sons | ,, .. | 7 | 302·6 | .. | .. | 1 | 345·8 | 1 | 315·9 | .. | .. | 1 | 350·5 | 16 | 420·5 | 26 | 379·2 | 423·2 |
| 16. Department of Agriculture | Red Poll | 14 | 300·2 | 2 | 281·3 | 4 | 379·4 | 12 | 368·2 | 5 | 365·3 | 6 | 333·4 | 15 | 340·0 | 58 | 338·4 | 415·8 |
| 17. Read, Estate of the late J. D. | Jersey .. | 4 | 301·0 | 5 | 287·6 | 3 | 321·9 | 3 | 332·6 | 2 | 382·5 | 3 | 399·3 | 8 | 390·5 | 28 | 346·2 | 407·7 |
| 18. Meaklim Bros. .. | Dairy Shorthorn | 4 | 280·3 | 5 | 301·3 | 2 | 376·9 | .. | .. | 1 | 345·3 | 2 | 354·0 | 11 | 384·7 | 25 | 346·7 | 400·5 |
| 19. Tomasetti, B. G. | Ayrshire | 4 | 272·7 | 2 | 267·9 | 10 | 338·5 | .. | .. | 2 | 302·9 | 2 | 320·2 | 8 | 386·7 | 28 | 334·0 | 397·6 |
| 20. Ballarat Orphanage | Jersey .. | 4 | 297·8 | 3 | 309·9 | 6 | 308·6 | 6 | 383·5 | 4 | 326·9 | 4 | 362·0 | 7 | 314·3 | 34 | 330·3 | 394·5 |
| 21. Butcher, F. T. .. | Red Poll | 9 | 254·2 | .. | .. | 2 | 291·6 | 1 | 299·7 | 4 | 408·0 | 2 | 273·5 | 10 | 387·8 | 28 | 329·6 | 389·6 |
| 22. Atkinson, W. K. | Dairy Shorthorn | 14 | 248·7 | 1 | 175·5 | 7 | 245·5 | .. | .. | 2 | 308·9 | 3 | 326·8 | 28 | 381·7 | 55 | 321·1 | 386·2 |
| 23. Smith Bros. .. | Jersey .. | 11 | 240·1 | 5 | 281·7 | 4 | 257·5 | 5 | 281·8 | 4 | 289·9 | 2 | 385·0 | 21 | 346·3 | 52 | 301·7 | 371·0 |
| 24. Smith, R. W., and Son | Friesian.. | 10 | 266·5 | 1 | 270·6 | 3 | 247·9 | 2 | 262·7 | 2 | 354·0 | .. | .. | 9 | 339·4 | 27 | 295·1 | 365·5 |
| **HERDS OF 15 TO 24 COWS.** | | | | | | | | | | | | | | | | | | |
| 1. Maloney, P. J. .. | Jersey .. | 4 | 430·3 | 5 | 449·1 | 2 | 530·1 | 3 | 550·7 | .. | .. | 2 | 530·4 | 5 | 565·2 | 21 | 503·1 | 570·9 |
| 2. Jackson, H. .. | ,, .. | 6 | 360·8 | 3 | 493·0 | .. | .. | 2 | 548·6 | 3 | 508·0 | 1 | 361·0 | 2 | 602·6 | 17 | 460·6 | 536·9 |
| 3. Masters, S. H., and Son | ,, .. | 4 | 356·2 | 2 | 382·8 | .. | .. | 1 | 494·9 | 3 | 454·6 | .. | .. | 8 | 473·9 | 18 | 435·6 | 484·8 |
| 4. Department of Agriculture | Friesian.. | 9 | 350·2 | 2 | 295·9 | 1 | 448·1 | 2 | 353·9 | 2 | 470·1 | .. | .. | 5 | 506·2 | 21 | 398·6 | 475·9 |
| 5. Mitchell, R. H. | Jersey .. | 1 | 325·3 | 1 | 360·3 | 2 | 471·3 | .. | .. | 2 | 448·6 | 1 | 507·6 | 8 | 441·7 | 15 | 437·8 | 469·8 |
| 6. Gay, W. C. R. | ,, .. | 3 | 386·1 | 1 | 456·3 | 3 | 392·3 | 1 | 318·0 | 1 | 429·7 | 2 | 530·2 | 9 | 418·7 | 20 | 419·3 | 463·8 |
| 7. Hardie, R. B. .. | ,, .. | 5 | 368·2 | 3 | 351·5 | 1 | 333·1 | 1 | 410·7 | 3 | 397·4 | 1 | 374·1 | 9 | 401·7 | 23 | 383·5 | 438·8 |
| 8. Clark, P. W., and Son | ,, .. | 2 | 283·3 | 2 | 368·6 | 2 | 346·9 | 1 | 382·8 | 2 | 494·3 | .. | .. | 9 | 407·0 | 18 | 390·7 | 433·3 |
| 9. Nicholas, M. A. | ,, .. | 4 | 270·8 | 2 | 342·9 | 2 | 297·7 | .. | .. | 1 | 501·4 | 2 | 435·6 | 11 | 434·1 | 22 | 386·9 | 432·2 |
| 10. Stephens, Dr. F. G. | Guernsey | 4 | 343·4 | 3 | 332·1 | 2 | 259·8 | .. | .. | 1 | 347·5 | .. | .. | 5 | 427·3 | 15 | 358·2 | 423·6 |
| 11. Handbury, J. E., and Son | Jersey .. | 8 | 267·6 | .. | .. | 3 | 361·9 | 3 | 371·4 | .. | .. | 1 | 416·2 | 6 | 427·9 | 21 | 348·8 | 418·4 |
| 12. Trevaskis, F. T. | ,, .. | 8 | 285·8 | 2 | 327·0 | 3 | 349·0 | 1 | 246·4 | .. | .. | .. | .. | 1 | 445·1 | 15 | 311·9 | 409·3 |
| 13. Cowan, G. L. S. | Friesian.. | .. | .. | 3 | 262·8 | 1 | 316·1 | 2 | 322·5 | 2 | 418·2 | 1 | 353·2 | 7 | 409·3 | 16 | 362·8 | 400·8 |
| 14. Banyule Stud .. | Jersey .. | 8 | 273·1 | 1 | 351·5 | 2 | 305·9 | 2 | 263·2 | 1 | 372·1 | 2 | 416·4 | 4 | 390·7 | 20 | 322·1 | 395·6 |
| 15. Colenso, L. W. | ,, .. | 3 | 250·0 | 2 | 260·1 | 1 | 270·0 | 2 | 306·3 | 3 | 333·2 | 3 | 399·4 | 9 | 409·5 | 23 | 349·4 | 394·2 |
| 16. Wade, G. F. .. | ,, .. | 4 | 295·9 | 1 | 351·0 | 3 | 332·4 | 1 | 262·1 | .. | .. | 4 | 363·9 | 8 | 349·0 | 21 | 335·3 | 384·0 |
| 17. Hore, M. T. .. | Friesian.. | 4 | 248·9 | 1 | 233·9 | 4 | 277·7 | 3 | 347·4 | 1 | 263·1 | 3 | 357·4 | 6 | 398·4 | 22 | 323·1 | 380·3 |
| 18. McKenzie, Mrs. E. J., and Sons | Jersey .. | 4 | 261·8 | 2 | 262·2 | 4 | 317·1 | 4 | 342·0 | .. | .. | 1 | 288·0 | 8 | 344·0 | 23 | 315·1 | 373·9 |
| 19. Parker, L. M. .. | Dairy Shorthorn | 4 | 208·5 | 1 | 208·1 | 4 | 311·5 | 4 | 294·0 | 2 | 338·5 | 3 | 379·1 | 6 | 330·5 | 24 | 302·6 | 360·4 |
| 20. Hurrey, Estate of the late W. H. | Jersey .. | 3 | 268·4 | 2 | 277·4 | .. | .. | 2 | 322·2 | 2 | 329·8 | .. | .. | 7 | 327·9 | 16 | 310·0 | 358·0 |
| 21. Black, Estate of the late I. S. | Ayrshire | 5 | 288·0 | 4 | 223·0 | 2 | 315·2 | 2 | 235·8 | .. | .. | .. | .. | 3 | 302·4 | 16 | 273·8 | 354·3 |
| 22. Broad, A. J. .. | Jersey .. | 4 | 241·3 | 2 | 344·4 | 1 | 328·3 | 1 | 282·9 | 1 | 403·5 | 2 | 344·6 | 6 | 279·9 | 17 | 296·3 | 350·2 |

| Owner. | Breed. | Junior 2-year-old. | | Senior 2-year-old. | | Junior 3-year-old. | | Senior 3-year-old. | | Junior 4-year-old. | | Senior 4-year-old. | | Mature. | | Total Herd. | Average without Allowances. | Average with Allowances. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | Average. | No. | Average. | No. | Average. | No. | Average. | No. | Average. | No. | Average. | No. | Average. | No. | | |
| | | | lb. | | lb. | | lb. | | lb. | | lb. | | lb. | | lb. | | lb. | lb. |
| **HERDS OF 10 TO 14 COWS.** | | | | | | | | | | | | | | | | | | |
| 1. Ronalds, O., and Son | Jersey .. | 3 | 377·2 | .. | .. | .. | .. | 2 | 443·2 | 1 | 541·8 | 1 | 674·9 | 3 | 508·0 | 10 | 475·9 | 529·9 |
| 2. Dennis, Mrs. A. A. | ,, .. | 4 | 379·3 | 2 | 462·9 | .. | .. | 2 | 473·3 | 1 | 366·4 | .. | .. | 2 | 419·0 | 11 | 417·6 | 494·0 |
| 3. O'Neill, J. .. | ,, .. | 3 | 317·8 | 1 | 418·1 | 2 | 470·4 | .. | .. | 3 | 479·5 | .. | .. | 2 | 384·7 | 11 | 410·9 | 478·2 |
| 4. Nancarrow Bros. | ,, .. | .. | .. | .. | .. | 2 | 430·1 | .. | .. | 1 | 355·5 | 2 | 509·3 | 5 | 451·8 | 10 | 449·3 | 473·3 |
| 5. Williams, Estate of the late F. A. | ,, .. | 2 | 215·4 | 2 | 402·1 | 2 | 464·7 | 1 | 443·7 | .. | .. | .. | .. | 7 | 445·1 | 14 | 408·8 | 456·0 |
| 6. Dunmore, T. J. | ,, .. | 2 | 280·4 | 1 | 351·6 | 3 | 379·1 | 1 | 430·2 | 2 | 379·8 | .. | .. | 2 | 402·7 | 11 | 367·7 | 433·2 |
| 7. Fixter, A. .. | Guernsey | 2 | 279·1 | 1 | 349·0 | 2 | 364·9 | 1 | 317·9 | 1 | 352·6 | .. | .. | 4 | 423·2 | 11 | 363·6 | 418·2 |
| 8. Hodgins, G. E. | Jersey .. | 5 | 239·5 | 1 | 399·0 | .. | .. | 2 | 391·8 | .. | .. | 1 | 486·2 | 3 | 385·1 | 12 | 335·1 | 405·1 |
| 9. Shearman, A. and W. | 3,, .. | 1 | 278·3 | 1 | 271·9 | 3 | 375·7 | .. | .. | 2 | 340·0 | 1 | 306·5 | 6 | 401·5 | 14 | 362·3 | 402·3 |
| 10. Broad, Mrs. A. A. | ,, .. | 2 | 254·1 | 1 | 307·7 | 4 | 328·0 | 1 | 335·4 | 1 | 322·1 | .. | .. | 5 | 381·3 | 14 | 335·2 | 389·4 |
| 11. Bruhn, C. H. .. | ,, .. | 3 | 246·1 | 2 | 334·8 | 1 | 239·4 | 2 | 310·6 | 1 | 301·6 | 1 | 345·4 | 3 | 415·1 | 13 | 321·1 | 383·2 |
| 12. Hicks, E. J. .. | ,, .. | 3 | 271·8 | .. | .. | 1 | 378·8 | 1 | 278·7 | 2 | 367·6 | 3 | 350·7 | 3 | 322·8 | 13 | 325·3 | 374·5 |
| 13. Unthank, Miss F. | ,, .. | 5 | 270·6 | 1 | 354·8 | 1 | 351·1 | 2 | 325·0 | 1 | 237·1 | .. | .. | 2 | 278·4 | 12 | 291·9 | 370·2 |
| 14. Chadderton, J. E. | ,, .. | 2 | 252·3 | .. | .. | 2 | 301·9 | 4 | 347·4 | .. | .. | .. | .. | 6 | 334·2 | 14 | 321·7 | 367·4 |
| 15. Pattison, G. .. | Ayrshire | .. | .. | 3 | 272·3 | .. | .. | 2 | 326·9 | .. | .. | 3 | 357·0 | 2 | 312·0 | 10 | 316·7 | 364·7 |
| 16. Tyssen, C. J. .. | Jersey .. | 6 | 217·6 | 1 | 326·5 | .. | .. | .. | .. | .. | .. | 1 | 359·1 | 4 | 374·7 | 12 | 290·8 | 360·8 |
| 17. Macauley, C. W. | ,, .. | 7 | 349·3 | .. | .. | .. | .. | 4 | 288·1 | .. | .. | .. | .. | 1 | 266·3 | 12 | 263·6 | 353·6 |

# CRYSTALLIZED GINGER

Green ginger is now available after an absence of several months. Many housewives who were unable to obtain it when they needed it for preserves will welcome directions for preserving a supply for future use and for use as a sweetmeat. Only fresh ginger roots should be used. The roots should be scrubbed with a brush and then put in a pan and covered with cold water. Bring the water to the boil, then discard the water and replace with fresh cold water and bring to boil. Repeat this operation twice more, then allow the ginger to simmer gently until it is tender, usually for 3 to 4 hours.

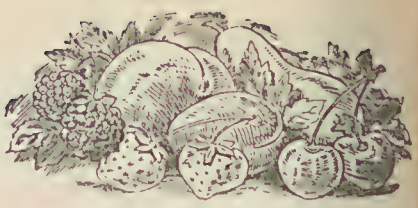
Drain off the ginger, saving the liquid. Scrape the outer skin from the roots and put in a basin. Make a syrup, by boiling for five minutes, 6 oz. of sugar to each pint of ginger liquor used. It will take about 3 quarts of liquid to 5 lb. of ginger.

Pour the hot syrup over the ginger roots and leave for 24 hours. Then strain off the syrup and add another 6 oz. sugar to each pint of liquid used in the first place. Boil five minutes and pour over the ginger. Leave for 24 hours. Repeat the addition of sugar and steeping on the following two days, thus making a total of 24 oz. of sugar per pound of ginger.

The ginger is left in the final syrup for three to four days, then drained and rolled in sugar or it may be put in jars and left in the syrup. The syrup should be kept for flavouring stewed fruit, &c.

[Contributed by the Fruit Preserving Branch.

# Some Uses for BOTTLED FRUITS



By RUTH BROMFIELD, Fruit Preserving Expert

WITH fresh fruit now scarce and expensive, the housewife who has spent many hours during the summer months preserving fruit, will be thankful for her full pantry shelves.

Monotony resulting from the repetition of flavours and dishes must be avoided in meal planning, and the inclusion of fruit in the daily diet will help to provide needful variety.

In addition to the obvious ways of using bottled fruit—with cereals for breakfast and with custard as a sweet—it can be used to make attractive variations to menus. Some recipes to this end are given hereunder :—

### Apricot Whip

1½ cups sweetened apricot pulp.
1½ tablespoons lemon juice.
3 egg-whites, stiffly beaten.
2 level tablespoons sugar.
pinch salt.

Mix pulp, lemon juice and salt together. Beat the sugar into the egg-whites, fold in the fruit mixture and serve garnished with chopped nuts. If desired, this mixture may be piled lightly into a buttered baking dish and baked in a slow oven for 30 to 45 minutes.

### Peach Pudding

6 sliced, bottled peaches.
¼ cup sugar.
2 cups milk.
3 eggs.
½ teaspoon vanilla.
½ teaspoon salt.
stale bread.

Add the sugar, salt, and vanilla to the milk and stir in the well-beaten eggs. Dip slices of stale bread in the mixture, and line a baking dish with them. Arrange layers of bread and sliced peaches to fill the dish. Pour any remaining liquid over the top. Set the dish in a pan of hot water and bake in a slow oven for about 30 minutes or until firm. Serve hot with any sauce.

### Apple Cream Cake

1 cup S.R. flour.
½ cup brown sugar.
½ cup butter.
1 egg.
pinch salt.

When all are well-blended, mould on a board, cut into three parts, and roll each part to about the size of a dinner plate. Bake in a slow oven till light brown. Take 1 bottle of preserved apples, flavoured with cinnamon and sugar, and spread thickly between the layers of cake. Cover the top of the cake with whipped cream, letting the cream run over the sides of the cake until completely covered. Serve cold.

### Pear Conserve Pie

Place halves of bottled pears in an unbaked pastry shell, and cover with 2 tablespoons of pear conserve. Add more pears and cover with one tablespoon of rich cream. Add top layer of crust and bake in a hot (400) oven for thirty minutes. Serve warm.

### Prune and Apricot Upside-down Cake

¼ cup butter.
1 beaten egg.
1 cup milk.
2¼ cups flour.
½ teaspoon salt.
5 tablespoons shortening.
4 teaspoons baking powder.
⅔ cup sugar.
½ cup brown sugar.
½ teaspoon lemon rind.
bottled apricot halves.
stewed prune halves.

Cream butter and brown sugar; add lemon rind. Spread on bottom of cake pan, approx. 8 inches square by 2 inches deep. Arrange apricot and prune halves to form a design on the sugar mixture. Cream shortening, add sugar slowly, then egg; and beat well. Add milk alternately with sifted flour, baking powder and salt. Mix thoroughly, pour batter carefully over fruit in pan. Bake 50 minutes in moderate oven. Turn onto serving platter, upside down.

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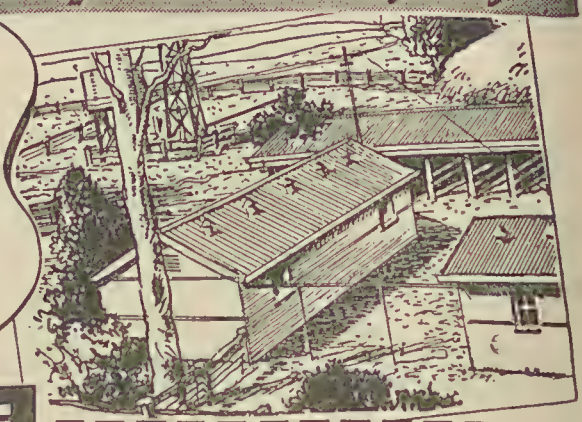

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# CLOVER-LEY FARMING

By R. H. HAYMAN, B.Agr.Sc., Acting Manager, Experiment Farm, Rutherglen.

THE main problem confronting the early settler in Victoria was that of carving a home and a living from the wilderness. The soil, enriched by the organic matter produced by countless centuries of plant life, was in excellent condition to grow good crops and produce good pastures, and was farmed without thought of manure or rotation. In those early years the possibility that this mine of soil fertility would come to an end was given little attention, but as time went on and cropping became more intensive, it was found necessary to use fertilizers to maintain yields. In this regard the discovery and introduction to Australia of superphosphate was of outstanding importance.

Many of the fertile soils of the early days were of mellow and friable texture and easily worked, but with intensive farming have tended to become difficult to handle. They become powdery when dry, run together badly when wet, give relatively low yields even when superphosphate is sown with the crops, and generally are said to have become worked out. This condition is due to the depletion of mineral reserves and even more so to the exhaustion, by constant cultivation and cropping, of the reserves of organic matter in the soil. This, in turn, results in lack of nitrogen and loss of crumb structure, two vital factors on which the fertility of the soil depends.

Any decline in yields which occurs from this cause on such soils gives rise to a corresponding increase in the cost of production of crops grown on them, as the same work must be done to produce the final crop, whether it is a good one or a bad one. Such a state of affairs, if widespread, would bode ill for our agriculture which is becoming more than ever dependent on low cost production if it is to survive in face of world competition in the future. It is, therefore, urgently necessary that our production of grain, meat, milk, wool, &c., per unit of area and per unit of production cost should receive close study if we are to survive that competition.

### *Building up the Soil*

A prime step in increasing the efficiency of farm output is the maintenance and, if necessary, building up of the soil to that condition of fertility which will allow of maximum returns of produce for the labour involved. In the countries of the Old World this problem has been met by devising wise systems of farm management and rotation, so that a certain area of land is not made to produce crops unless it has first been brought to a fit state of fertility to do so. The systems arrived at overseas naturally are those best fitted to the particular demands of climate, season, &c., in the localities in which they have been developed.

Victorian farmers are faced with entirely different conditions, but it is still possible to develop a farming technique best suited to such conditions.

Of the various systems of rotation and management which have been investigated under Victorian conditions, the one which so far appears to have the widest application is known as "clover-ley farming". As the name implies, the clover-ley system is based on the rotation of topdressed clover-grass pastures with cereal or other crops. Use is made of the well-known ability of the

A heavy crop of Algeribee oats (between 2½ and 3 tons per acre) grown on stubble at Rutherglen after clover-ley.

clover plant to obtain nitrogen from the air, and thus increase the reserves in the soil which ultimately become available for the use of other plants and crops. Together, the nitrogen made available by the clovers, and the organic matter and minerals which are returned to the soil by the animals grazing on the pasture, restore fertility to worn out soils.

In practice, the system consists of sowing down the farm to a predominantly clover pasture, commencing with those paddocks which have been longest under cultivation. After several years under ley, each paddock, now greatly restored in fertility, is brought back under cultivation for one or two seasons, after which it is returned to pasture for a further spell of several years; and cultivation is resumed in a fresh paddock.

The advantages of this system of rotation are many. One of the chief benefits is its replacement of one crop farming, with its attendant evils of soil depletion and extreme losses due to price fluctuations, or perhaps total failure of the enterprise for a season because of disease or unfavourable weather conditions.

The nature of clover-ley farming renders diversification of farm enterprise inevitable, for when pastures are grown live stock of some kind must be carried. It also allows a fluidity of practice not possible with systems of single-crop farming. It is not essential that a paddock be broken up for cultivation every year. Rather, the area of crop, or alternatively the amount of grazing which the farmer carries out, can be varied according to his assessment of the probabilities of season and market. If, in his district, it appears that his particular line of stock-raising will pay better than the crop usually grown under his conditions, the farmer will have pastures available to carry out his stocking programme to the full. If it appears that crops will be more remunerative, he may sow an extensive area, confident that his land is fit to produce a maximum crop. In short, the range of his farming activities has been widened, greatly increasing his ability to withstand the vicissitudes of markets and seasons.

### *Crop-pasture Rotation*

The farmer whose land is alternatively spelled under crop and pasture has little to fear from soil-borne disease troubles either in his crops or with his stock. The organisms which normally reduce the yields of cereals, flax, peas, potatoes, &c., rarely survive for more than a short period under pasture, so that as far as these crops are concerned, ley ground is practically disease-free. On the other hand, the eggs of parasites which normally infect stock because of their presence on pasture, are destroyed by a period under cultivation, so that this type of stock worry is also reduced.

The "one-crop" farmer, if he is to conserve supplies of fodder against bad seasons, must sow or otherwise set aside a certain area of land for the purpose each season. On the other hand, the farmer who has a considerable area of pasture is always in the position, once he has established his rotation, to take advantage of good seasons cheaply to conserve an ample supply of reserve fodder from his surplus pasture growth, without being put to the necessity of making provision for reserves by growing special crops on land which he could better employ.

### *Rutherglen Experiments*

At the Rutherglen Experiment Farm, clover-ley farming has been the subject of intensive study for several years, and the results of some of the experiments have been discussed in previous issues of this Journal. Some figures

obtained from these tests are given hereunder, which demonstrate the extent to which soil fertility can be improved by good clover pasture. They indicate also how productivity of the pasture itself is increased compared with the type of growth made on cultivation land which has been allowed to rest under "volunteer" pasture, a common but wasteful practice employed when worked out land is "spelled".

In a field at Rutherglen which had been under continuous cultivation for many years, an area of land was set aside and sown to subterranean clover and Wimmera rye grass; another area was turned out and allowed to grow such pasture as "volunteered" upon it. The remainder of the paddock was maintained under cultivation. During the next four years the clover pasture carried an average of 2·2 dry sheep per acre, in comparison with 1·6 dry sheep carried by the volunteer pasture. In the year following, both pastures were stocked with 2·5 ewes and 100 per cent. lambs per acre. The lambs grown on the clover pasture had an average frozen weight of 40·6 lb. and all were graded first quality. Those from the volunteer pasture had an average weight of 32·8 lb., and only 50 per cent. of them reached first quality. After five years under ley, both areas were fallowed with the rest of the paddock and sown to wheat, when, in a very dry season, the following yields were obtained:—

Wheat, after clover ley, fallowed 24·3 bus. per acre.

Wheat, after volunteer ley, fallowed 19·6 bus. per acre.

Wheat on old cultivation land, fallowed 14·1 „ „

This evidence of improvement in fertility, due to the growing of the clover pasture, was further supported by the results of soil analyses made during the experiment. The analyses showed a marked increase, during the time of the experiment, in the nitrogen content of the soil during the period under clover ley; a less pronounced increase in that under volunteer pasture; and a decrease in the case of the soil which was retained under cultivation.

Other experiments carried out at Rutherglen have confirmed these results, which demonstrate the ability of clover ley pastures to build up soil fertility and increase the number of stock which can be carried.

### *Some of the Benefits of Clover-ley*

Crop production costs have been reduced materially by the use of the clover-ley rotation. Satisfactory crops of wheat can be grown without fallow in all but the driest of seasons, and without the need to use a mouldboard plough for breaking up the ley ground. By omitting the fallow period before sowing two main economies are effected. In the first place the pastures and later the dry feed can be grazed right through the spring and summer; full use being made of the land for grazing right up to the time of sowing. Secondly,

A poor, thin crop growing on "worked out" soil in experimental plots at Rutherglen.

1938 wheat plots on land rested in pasture since 1931. Left—Wheat after natural pasture. Right—Wheat after subterranean clover and Wimmera rye grass established with the last cereal crop (oats) in 1931. Note the heavier crop of wheat following the clover.

the expense of cultivating fallow ground through the summer is avoided. Good crops also have been obtained from ley ground which has been broken up with implements of the one-way or sundercut disc type. As these implements enable more land to be worked than could be handled in the same time by a mouldboard plough, economy in cultivation costs are possible. Finally, the increase in yield per acre obtained from crops grown on clover ley land further reduces the cost of production.

### *Clover-ley and Climate*

The type of clover-ley and the extent to which clover-ley farming can be practised in Victoria is governed by the incidence and reliability of rainfall, and the type of agriculture engaged upon in the different localities. In areas of heavy and reliable rainfall (over 30 inches per annum) and not too severe winter temperatures, pastures may consist of perennial clovers such as white Dutch, strawberry, red or alsike, while the grasses would be perennial rye or cocksfoot. In areas of more moderate rainfall (21 to 28 inches), and summer drought, or at best, uncertain and irregular summer rains, annual clovers and grasses play a more prominent part. Most important of these are subterranean clover and Wimmera rye grass. Of the perennials only lucerne and phalaris tuberosa appear capable of withstanding the erratic nature of the seasons. Introduced grasses and clovers of the more valuable and prolific types do not appear to such advantage in areas of low and somewhat erratic rainfall (under 21 inches). There are types of subterranean clover which will survive in parts of this area, but some are unsatisfactory as fodder plants, while the possibilities of the others have not yet been fully explored. The principal grasses which can survive under these conditions are certain strains of Wimmera rye grass, barley grass, and sundry bromes and fescues of relatively low fodder value. Lucerne, in some areas, has shown definite promise as a soil building plant of pasture value.

### *The Heavy Rainfall Districts*

In certain of the heavy rainfall districts dairy farming on grassland is general, and decline in soil fertility is mainly brought about by the failure of the farmer adequately to replace the minerals taken from his land and sold in the milk, butter, &c. On this type of country, which is typical of much of the wetter portion of the Western and Gippsland districts, soil fertility is best maintained by establishing permanent pastures of mixed perennial clovers and grasses which are subsequently maintained by adequate topdressing. A great deal of

valuable work has already been done on the establishment and maintenance of this type of pasture by officers of the Department of Agriculture working in conjunction with the Pasture Improvement League, and information of an extensive nature is now available to the farmer on the subject. On many of the farms on this class of country arable farming has been abandoned. Dairying gives higher returns, and as adequate fodder can be conserved from surplus pasture growth in the spring, it is not necessary to grow cereal crops for hay.

Most of the remainder of the good soils in the heavy rainfall districts are given over to mixed farming, consisting mainly of potatoes, onions hay, flax, and vegetables, together with a certain amount of dairying and fat-lamb raising. These areas comprise most of the remaining heavy country in the Western, Central, and Gippsland districts. Soil fertility here is being heavily drawn upon by the types of crop grown, which are mostly gross feeders, and a more extensive rotation is required than appears to be the usual practice at present. Because of the good rainfall, fallowing or resting of land is not usual, and it is common to see the same piece of land growing two crops (such as oats and potatoes) in the same year. Diseases of a soil-borne nature, which are a common occurrence due to the frequency with which land is sown to the same type of crop, and extensive fluctuations in price are both indications that more extensive rotation systems would be of value. Because of the frequency with which land is cultivated, subterranean clover is preferable to perennial types for inclusion in pastures, as it has been shown that it is capable of re-establishment after cultivation, without further re-seeding.

### *Pasture Improvement in Sandy Country*

There are large tracts of country in Victoria, both in the Western and Gippsland districts, of a rather poor, sandy nature. Both localities experience an annual rainfall of approximately 30 inches. Hitherto, these areas have provided light grazing only, but recent experiments have demonstrated that subterranean clover can satisfactorily be established on them with the aid of topdressing. The establishment of these pastures has brought about a large increase in the number of stock carried, and has raised the fertility of the soil to such a level that perennial rye grass has entered the pasture as a volunteer plant in places such as some of the one-time "bayonet grass" country of Gippsland, which now carries dairy cattle. The area of this light sandy country in Victoria is extensive, and the possibilities of expanding production upon it, by using clover-ley to raise the standard of soil fertility, are great.

The districts in Victoria having a rainfall of from 22 to 27 inches constitute a large portion of the North-Central, Eastern, and North-Eastern areas of the State. At the present time sheep raising and some wheat growing are engaged upon on the better soils, while light grazing is carried out on the lighter soil types. The light soils have shown themselves capable of considerable increase in fertility and production when sown to subterranean clover pastures which are topdressed, and properties which at one time provided only light grazing have been sufficiently improved to enable the production of fat lambs to be engaged upon. The Rutherglen Experiment Farm, which has pioneered the investigational work in problems of clover-ley farming in this State, and which lies just within the lower rainfall boundary of

Left.—A Wimmera rye grass and clover mixed pasture at Rutherglen. Right—Wimmera rye grass only.

the region, is typical of the heavier soil types. On this country subterranean clover-ley has exhibited great potentialities in the direction of raising soil fertility and expanding the scope of farming activities, enabling increased numbers of livestock to be carried in conjunction with low cost cereal production.

All of this area was under cape weed originally, but subterranean clover is now taking control.

### *The Low Rainfall Areas*

The areas of Victoria which receive a 20-inch rainfall or less lie principally in the Northern, Mallee, and Wimmera districts. Cereal cultivation and the grazing of sheep are the main lines of agricultural enterprise and it is in this area of the State that clover-ley farming, though probably the most desirable type of rotation for improving soil fertility, has at present the least possibilities, due to failure to find a truly satisfactory legume for the conditions. Lucerne has, in isolated cases, shown promise from the point of view of both grazing and maintenance of soil fertility, but as yet there is insufficient evidence as to the extent of its possibilities.

### *Oats in the Rotation*

Results of experimental work at Rutherglen, Longerenong, and Werribee, have demonstrated that, at the present time, oats for grazing as pasture are probably the most satisfactory crop to include in the rotation in order to maintain fertility and production. By making use of early and late types, and by early sowing, oats can be made to provide grazing for sheep right through the season. They may be grazed completely out or, after the winter grazing, saved for hay, grain, or summer feed. They provide nutritious grazing during the autumn and winter months, and excellent fat lambs can be raised on them, while their ability to increase soil fertility has been well demonstrated by the improvements in yields of the succeeding wheat crops at the various stations.

We in Australia are becoming aware of the damage which exploitative systems of farming have done to our agricultural and grazing lands. The decline in fertility of certain of our soils, and the loss in production attendant upon it, are disturbing factors in our rural economy, and it is a matter of urgency that the situation be taken in hand before fertility reserves in the soil are still further depleted. The results of research over the past few years indicate that, over a very large area of Victoria, it is possible economically to increase the fertility of the soil by the rotation of topdressed clover pastures with cultivation land. In drier areas where it has not yet been possible to establish leguminous pasture, oats as a grazing crop have proved capable of at least maintaining fertility at its present levels.

# Seasonal Diseases of Dairy Cows

## Milk Fever — Grass Tetany

By A. R. GRAYSON, B.V.Sc., Senior Veterinary Officer

IN recent years, the importance of minerals to the animal body has been stressed, and most dairy farmers have realized the advisability of supplementing the diet, particularly of high-producing cows, with minerals. Mineral supplements are usually provided in the form of licks containing calcium and phosphorus, either as bone meal, bone flour or dicalcic phosphate; molasses, which has a relatively high content of both calcium and magnesium, is also used as an adjunct to the usual mineral lick. All fodders contain minerals, but when the mineral content of foods is low, or when owing to exceptional circumstances, the demand for minerals is greater than can be supplied through the normal food supply, mineral supplements are necessary.

Most of the minerals essential for health are stored within the animal body and can be used as required, being carried to the organs and tissues by the blood serum, the clear, straw-coloured, fluid portion of the blood stream. In normal health the concentrations of these various minerals in the blood serum, within limits, remain fixed or constant. Variations in these concentrations, however, brought about by abnormal conditions, may give rise to sickness and even death.

Two conditions commonly met with early in the lactation period are those known as milk fever and grass tetany. Milk fever is associated with a lowering of the calcium content of the blood, and some observers have shown that in grass tetany, the magnesium content may be lowered, although the significance of this observation is not thoroughly understood.

### *MILK FEVER*

In milk fever the great majority of cases occur during the 72 hours immediately subsequent to calving, although the disease is occasionally met with towards the end of pregnancy and even during the act of parturition. It commonly attacks those cows possessing high milking qualities and in which, parturition having been simple and uncomplicated, the development of heavy lactation has been rapid. The period of greatest susceptibility in the cow corresponds to the period of greatest milk secretion, that is, five to eight years of age. Cows on their first or second calf are rarely affected.

#### *Symptoms*

The onset of the attack is often sudden. Restlessness may be noticed accompanied by some excitement. The cow moves with a

Typical attitude of a cow with milk fever.

"paddling" gait. The restlessness increases, the facial expression becomes staring and anxious. Trembling is noticed and the gait becomes staggering. The cow falls down and after perhaps making ineffectual efforts to rise, she remains down. The symptoms of nervous disturbance give place to a condition of somnolence which rapidly develops into coma or unconsciousness. If supported, the cow lies on her sternum (breastbone) with the head turned round so that the side of the face is pressed against the shoulder. If the neck be straightened forcibly, the head, upon release, returns to its former position. The eyes are glassy, the breathing laboured and the pulse soft and slow. The body temperature is usually sub-normal—never high—as the name milk fever would suggest. There

is a more or less complete bowel stasis leading to "bloat" if the animal is lying on her side. There is a marked diminution of milk secretion and a retention of urine and faeces.

All of the above symptoms are seldom observed in any one case. Often the cow is found down in what has come to be regarded as the typical attitude in milk fever cases. Quite often too, the cow is first noticed in the staggering gait condition, and if treatment, as described later, is given, the progress of the disease condition is stopped and recovery is rapid and complete.

### *Treatment*

Milk fever has been recognised since about 1806, and has been successfully treated since 1890. The first successful treatment consisted of injecting into the mammary gland a solution of potassium iodide. Later, the treatment was modified by inflating the udder with air instead of injecting fluids into the gland, and to-day the mortality rate is less than 1 per cent. in treated cows.

Although this treatment is so specific and so successful, it remained quite empirical. No absolute knowledge was possessed as to why it was successful although many theories were advanced in an effort to explain the result. In 1925, it was shown that milk fever was associated with an acute hypocalcaemia, possibly due to insufficient activity of the parathyroid glands, which among other functions control the level of calcium in the blood stream.

In cases of milk fever the calcium concentration in the blood may be less than half the normal value. It is interesting to note the mammary inflation with air is followed by a rapid return to normal of the blood calcium level, and this is possibly due to the distension of the mammary tissue forcing back into the blood stream the calcium which has been concentrated in the secreting tissues of the udder.

### *Method of Inflation of the Mammary Gland*

The inflation apparatus consists of a metal cylinder packed with cotton wool and attached to a rubber tube, which in turn is attached to a teat syphon. Air is pumped through the apparatus by means of a rubber bulb syringe, or bicycle pump. Scrupulous care in the sterilization of the apparatus must be observed, the teat syphon, metal cylinder and rubber tube being boiled thoroughly before use. The cotton wool in the cylinder acts as an air filter. The udder must be carefully examined for evidence of mastitis, and any affected quarters must not be inflated. The udder should be washed with an antiseptic solution, and it is advisable to swab each teat, particularly the teat orifice with methylated spirit. The teat syphon is inserted into the teat canal with a screwing motion, and the quarter inflated with air, care being taken not to over-inflate. The other quarters are treated similarly.

By massage the air can be forced into the udder tissue to fill space within the alveoli, (cells within the udder), but it is not advisable to tie the ends of the teats with tape to retain the air in the udder, as injury to the teat and/or teat duct may result. It is advisable to prop the cow into a sitting position, using bags of chaff, &c., for that purpose. On no account should medicinal drenches be given while the cow is down in a comatose state, as pneumonia would be the almost invariable result.

### *Calcium Boro-gluconate Treatment*

The calcium boro-gluconate treatment followed the discovery that milk fever was an acute hypocalcaemia. The subcutaneous injection of the soluble calcium boro-gluconate—2½ oz. in 10 oz. of water—has now, to a large extent, replaced udder inflation. The injection is made in one or more points where the skin is loose. One big factor in favour of calcium injection is that it obviates the risk of mastitis—a condition which often followed udder inflation.

### *Method of Injection*

Calcium boro-gluconate 2½ oz. should be dissolved in 10 oz. of water which has been boiled and allowed to cool. The solution should be brought to blood heat before it is injected. An ordinary 10 cc. hypodermic syringe is quite suitable for making the injection. Both syringe and needle should be put into cold water and boiled before use. The injection must be a subcutaneous one, that is, under the skin, and the site selected for the injection preferably should be one where the skin is thin and movable, such as the area of loose thin skin behind the elbow. Tincture of iodine should be applied to the skin before the needle is inserted. Massage of the area during injection helps to diffuse the fairly large dose over a greater area of sub-cutaneous tissue, and so hastens absorption.

A suitable apparatus for the injection can be improvised on the farm (see diagram). It consists of a wide-mouthed pickle jar complete with cork. Two holes, of sufficient diameter to receive two pieces of glass tubing, are punched

through the cork. One piece of glass tubing (A) is short, and ends just below the bottom of the cork. The second piece (B) extends through the cork almost to the bottom of the jar. To the protruding end of (A) is attached a piece of rubber tubing about four feet in length, and a hypodermic needle is attached to the other end of this tubing. A suitable needle could be improvised by filing the end from a teat syphon, and sharpening it to a point. Sterilization of the whole apparatus is necessary, before use.

The boro-gluconate solution is placed in the jar, and the cork, with tubing attached, firmly inserted. To make the injection the jar is inverted and raised to the length of the rubber tubing after the needle has been inserted under the skin. Air enters through tube B, and air pressure plus gravity forces the solution through tube A, rubber tubing and needle. Massage of the area surrounding the point of injection is of definite advantage when this apparatus is used.

### *Course*

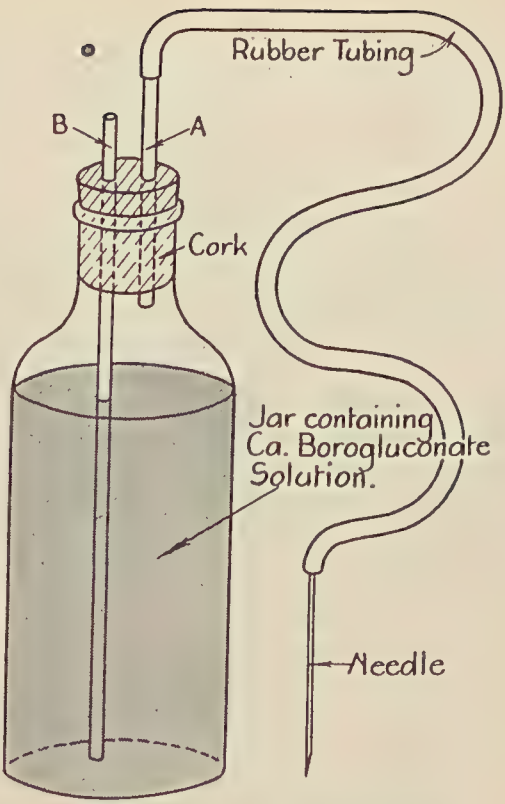
Following either udder inflation or the injection of the calcium salt, or both, even comatose animals recover within a few hours. The appetite and milk secretion are quickly resumed, and within twelve hours the case may be apparently normal. In other cases recovery is slower, and 24 to 48 hours may elapse before normality is reached. In such cases a repetition of the treatment may be necessary. Relapses may occur, and these are perhaps more common in those cases which recover quickly after treatment.

A purgative saline drench may be given *after* the cow has returned to normal.

### *Preventive Treatment*

The aim should be to conserve or augment the calcium in the blood stream, and to maintain the normal gland functioning. To this end, a balanced ration, including sufficient fibre or cellulose, which is essential for correct bowel functioning in ruminants, should be fed, and a mineral lick containing calcium, with molasses as an adjunct, should be made available to the cows.

It has long been recognised that the rapid emptying of the mammary gland (udder) by milking shortly after calving may precipitate an attack of milk fever, and therefore the practice of removing small quantities of milk, or alternatively, of permitting the calf to suckle the cow for the first 72 hours, is of distinct preventive




Siphon apparatus suitable for subcutaneous injection.

value. Calcium boro-gluconate (half dose) may be injected immediately after calving, and repeated in 24 hours.

## *GRASS TETANY*

Grass tetany occurs mainly in dairy cows three to four weeks or longer after calving. Other cattle (that is, beef types) may be affected.

### *Symptoms*

Two main types of the disease are noted. *Acute*, with a rapid onset, with great excitement, tetany of the muscles of the neck causing the head to be held high, greatly accelerated respirations, high temperature, champing of the jaws with salivation. A slight stimulus may precipitate a crash to the ground, convulsions and death.

*Sub-acute*, with nervousness and anxiety, twitching of muscles, loss of appetite, and stamping of the feet. The animal falls down and rises with difficulty. There may be frothing at the mouth and apparent blindness, evidenced by blundering into obstacles. The heart beat is strong and loud, and the pupils of the eyes

contract. Temperature is high. The animal finally goes down and convulsive movements of the limbs continue spasmodically. The death rate varies greatly—in some cases the animal dies in 48 hours. In other cases the animal recovers after being down for several days.

Grass tetany usually occurs when cattle are running on soft, luscious pasture, or on a crop of growing oats, and particularly if either pasture or crop is affected by frosts. When there is not a balancing ration of roughage the incidence of grass tetany is greatest.

### *Treatment*

Cases of grass tetany may occur when there is a low magnesium content of the blood, although this is not invariably so. Considerable success has followed the subcutaneous injection of a 25 per cent. solution of magnesium sulphate (Epsom salts). The dose is 2 oz. of Epsom salts dissolved in 8 oz. of water which has been boiled and allowed to cool to blood heat.

### *Preventive Treatment*

As with milk fever, preventive treatment should aim at maintaining the general body health. The feeding of a balanced ration including sufficient roughage to ensure correct bowel functioning is essential, particularly when the milking cows are being grazed on soft lush or young pastures. The provision of a readily accessible mineral lick consisting of dicalcic phosphate and salt with molasses as an adjunct is also advised.

Before and after calving, drenches of epsom salts and molasses—1 lb. of each—also form good preventive treatment.

Border line cases involving both low calcium and low magnesium values are also met with. In these cases which more commonly occur seven to twelve days after calving, a combined treatment is necessary, and the injection of the magnesium sulphate, together with the calcium boro-gluconate and/or udder inflation is often recommended.

The magnesium sulphate solution must be injected at a different site from that used for the calcium salt, preferably on the other side of the body.

### *Summary*

| Onset. | Symptoms. | Diagnosis. | Treatment. |
|---|---|---|---|
| One to three days after calving | Reeling, staggering, paresis, coma, low temperature | Milk Fever or Hypocalcaemia | Calcium boro-gluconate, and/or udder inflation |
| Three to four weeks after calving | Tetany, excitement, convulsions, high temperature | Grass Tetany or Hypomagnesaemia | Magnesium sulphate subcutaneously |

## DAIRY SUPERVISORS' EXAMINATION

Examination for qualification as a Supervisor under the *Milk and Dairy Supervision Act* 1928 will be held in Melbourne commencing 27th November, 1945. Written, oral and practical tests will be held. Candidates must attend at the University of Melbourne at 10 a.m., on the first day of the examination. Entries, with fee of 5s., must be lodged on or before the 15th November, 1945, with the Superintendent of Dairying, Department of Agriculture, Melbourne, C.2. Each candidate must furnish testimonials as to character and evidence of bona fide practical experience in dairy farming and allied branches of agriculture. Entry forms and syllabus are obtainable from the Superintendent of Dairying.

# Live Stock Notes

Compiled by A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

## *Preserve the Dairy Herds*

THE preservation of our herds of dairy cattle may be accomplished in two ways, firstly, by looking after the cows well and extending their milking life; and secondly, by rearing a larger number of heifers for replacement purposes.

The wastage of dairy cows is extremely high. This has been accentuated during war years by a shortage of manpower on dairy farms, shortage of bran, pollard and other fodders, the attractive wartime prices for cow beef and chopper cows, and more recently, by the drastic drought which has swept Victoria.

The average cow is milked for only three lactations, but on many farms cows are milked for more than six lactations. At the State Research Farm, Werribee, from 1928 to 1939, the average productive life of a cow was six lactations and for every 100 cows in the herd between sixteen and seventeen were lost each year by death and culling for age, disease, and unproductiveness. If the average milking life of the cows is extended from three to six lactations, the cost of rearing and bringing replacement heifers to production is spread over six years instead of three years.

Rearing and feeding dairy cows so that they will be more resistant to the many prevalent complaints of dairy cattle will do a great deal to preserve our herds. Irregular and bad milking, and insanitary conditions are very important predisposing factors to udder troubles. It costs no more to handle a cow quietly and milk her thoroughly. If such care is taken, returns will be increased by greater milk production and reduced wastage of cows. Feed may cost more now but this can be reduced by efficient use of pasturage and the conservation of home-grown fodder. The cost of the extra feed available for the cows will be small in comparison with the value of the increased yields of milk and the longer productive life of the cow.

### Slaughter of Dairy Cows.

During the past four years, the slaughter of dairy cows has exceeded previous figures by over 40,000 cows per year, and these cows have not been replaced by rearing more heifers. Our dairy herds are being rapidly depleted, and since 1942, the number of dairy cows has dropped from 900,408 milking and dry cows, to 859,200 this year.

Dairy cow numbers and slaughterings are shown in the following table:—

| Year at March. | Number of Dry and Milking Cows in Victoria. | Total Dairy Cattle. | Number of Cows Slaughtered. | |
|---|---|---|---|---|
| 1940 .. | 863,073 | not available | (1939–40) | 169,000 |
| 1941 .. | 904,915 | | (1940–41) | 167,000 |
| 1942 .. | 900,408 | | (1941–42) | 233,000 |
| 1943 .. | 877,164 | 1,445,530 | (1942–43) | 241,000 |
| 1944 .. | 875,796 | 1,406,028 | (1943–44) | 222,000 |
| 1945 .. | 859,200 | 1,364,202 | (1944–45) | 236,000 |

Prior to 1943, beef and dairy cattle statistics were not collected separately, but, during each of the last two years dairy cattle numbers have declined by 40,000 head. Slaughterings are 40,000 head above normal. Drought losses had not occurred when these figures were taken and are estimated at 50,000 head.

### More and Better Dairy Heifers.

The rearing of sufficient heifer calves for replacement purposes is an integral part of dairy farming but unfortunately it is being neglected by too many dairy farmers today. Last year, only 202,258 calves were reared. The year before, only 218,970 calves were reared and of these only 201,158 remained at the 31st March this year. In 1943, 281,412 calves were reared and this number was inadequate. Prior to that year, about 300,000 calves were reared

annually. To maintain our dairy herds and provide young stock for increased production, the rearing of at least 400,000 dairy heifer calves per annum is needed.

The following table shows the numbers of dairy cows and springing heifers, total cattle (beef and dairy) and of bobby calves and young cattle slaughtered since 1930.

| Year. | Cattle Population. Year ended March. | | Slaughterings. Year ended June. | |
|---|---|---|---|---|
| | Dairy Cows and Springing Heifers. | Total Cattle. | Young Cattle. | Bobby Calves. |
| 1931 .. | 619,416 | 1,335,342 | 32,000 | 94,000 |
| 1932 .. | 669,132 | 1,429,920 | 33,000 | 120,000 |
| 1933 .. | 775,538 | 1,637,530 | 40,000 | 131,000 |
| 1934 .. | 887,996 | 1,900,922 | 55,000 | 147,000 |
| 1935 .. | 910,187 | 2,185,080 | 59,000 | 202,000 |
| 1936 .. | 951,849 | 2,091,246 | 80,000 | 310,000 |
| 1937 .. | 968,555 | 2,005,759 | 87,000 | 393,000 |
| 1938 .. | 952,906 | 1,880,429 | 90,000 | 466,000 |
| 1939 .. | 889,259 | 1,697,395 | 81,000 | 367,000 |
| 1940 .. | 917,051 | 1,787,597 | 62,000 | 331,000 |
| 1941 .. | 942,107 | 1,922,336 | 64,000 | 332,000 |
| 1942 .. | 954,493 | 1,986,544 | 68,000 | 300,000 |
| 1943 .. | .. | 2,022,892 | 67,000 | 289,000 |
| 1944 .. | 939,484 | 2,013,033 | 77,000 | 297,000 |
| 1945 .. | 925,307 | 1,903,110 | 79,000 | 330,000 |

From the above table, it will be seen that the high number of calves slaughtered for human consumption has had little bearing on cattle numbers. Last year, J. T. Kelly, B.Agr.Sc., Science Field Officer of the Department of Agriculture, made a survey of the 330,000 calves slaughtered in Victoria and found that about 100,000 of them were heifers. The bulk of the heifers which are not reared are evidently destroyed on farms.

### Successful Rearing of Calves.

The successful rearing of dairy calves is probably dependent more upon the way they are treated than by any other factor. For this reason the dairy farmer's wife is usually more successful in rearing the calves than the farmer himself. During the first two weeks of its life the hand-reared calf must receive careful individual attention.

Farmers have repeatedly requested the Department to establish calf-rearing depots, but experience has shown that most success has been achieved when calves have been reared in small numbers on individual farms, although at the State Research Farm, Werribee, there have been as many as 65 calves on the bucket at one time and they did well. It is hoped that many farmers and some dairying companies will rear large numbers of heifers this year.

Where whole milk is sold, calves may be reared cheaply and well on as little as 25 gallons of new milk and about 200 gallons of gruel each and ample pasturage and good quality hay. The gruel is made by mixing 1 lb. meal with 1 gallon of water.

If near a cheese factory, the new milk and gruel can be replaced by whey. The quantity of new milk could be reduced to nearer 15 gallons and practically all of the meals can be eliminated. Beastings and other milk not suitable for sale, can be sterilized and used for calf feeding. The value of whey depends upon how the cheese is made. The best whey for calves is unseparated rennet cheese whey. Where muriatic and lactic acids are used to coagulate the milk a very poor whey for calf rearing is produced. If factories could deliver whey when they pick up the milk, more calves could be reared and more whey would be used.

### Foster Mothers.

To overcome labour problems, some farmers are rearing their calves on foster cows, as in the case of Mr. C. A. Boyes of Wodonga. Mr. Boyes rears four calves on one heifer or cow. The calves are weaned at 12 weeks old, in mid-October when there is still good feed available. The heifers and cows are then milked for the rest of their lactations. At first glance this may seem wasteful, but Mr. Boyes saves all the labour, whole milk, overhead and most of the other feed. With four calves each foster cow saves Mr. Boyes about £20 during this period and he has only lost twelve weeks' production from the cow.

## *Breeding Points in Cattle*

There is still a tendency among some breeders of stud stock to attach considerable importance to characters which have little or no bearing on the utility value of their animals. This results in the culling of stock which are, in the opinion of the breeder, inferior beasts, but which may have all the qualities desired by farmers to whom utility value is of much greater importance than fancy points.

Two examples which serve to illustrate this tendency have been noted in farming journals in recent months. The first was contained in the report of an interview with a stud breeder.

With reference to a particular breed of cattle, he is reported to have said that breeders should accept the fact that animals whose horns go up are inferior to those with a downward sweep, and that in order to prevent the the perpetuation of this fault, such animals should not be used for breeding purposes. This means that cattle possessing this characteristic but with otherwise excellent qualities, would be debarred from breeding. It has yet to be proved, however, that the shape to which horns grow has any relationship to the production of either milk or meat.

Pleasing to look at and profitable to breed, more pigs such as these should be used for breeding.

The second statement indicated that in a certain class of beef-type bulls being judged at a live stock show, there was one bull whose massive quarters would have earned him a higher place had he not been so dark in colour. It is surely a reflection on judging methods and relative values when so much importance is attached to the shade of colour of an animal's coat.

Probably many of the stock culled by stud breeders find their way to properties where they are used for breeding purposes, but on the other hand, some potentially valuable sires may never be made use of because they did not conform to breed type in some relatively minor characteristic.

The average farmer is not concerned with unimportant points of conformation, but desires to obtain stock which are economically useful and which will pass on their good qualities to their progeny.

The selection of the right type of stock for breeding purposes is a very uncertain matter. There is no surety that an animal chosen on general appearance will pass on its qualities to its offspring, neither does a study of the record of an animals' parents and grandparents always prove reliable in gauging its capacity to transmit its superiority. The only true measure of an animal's breeding ability is the quality of its own offspring.

(J. T. Kelly, B.Agr.Sc.,
Science Field Officer.)

## *Pig Notes*

One of the most severe critics of pig breeders is a man who buys store pigs and makes them into prime baconers. He attends a weekly market and often goes home without stores rather than buy pigs which he thinks are of an unsuitable type. Although he has empty pens and ample food on his farm, he contends that there is less loss incurred through having empty pens than in filling them with the wrong sort of pigs. He says, "you get plenty of those short, thick, slow-growing brutes without buying them deliberately".

In most pig markets there are too many store pigs of undesirable conformation because those pig breeders who breed and fatten their own pigs prefer to dispose of their less desirable pigs as stores rather than carry them to bacon weight; also, there are still some farmers who are content to breed from almost any kind of boars and sows, and a good many of their pigs are sold as stores.

Pigs of good bacon type are so readily available for breeding that there does not appear to be any excuse for farmers using undesirable breeding stock.

(L. A. Downey, H.D.A.,
Pig Expert.)

## *Quality in Hen Eggs*

The first essential for successful marketing of eggs is quality. Interior quality is of great ultimate importance, and apart from certain abnormalities the main consideration is freshness. Exterior points of quality such as condition of shell, colour and shape, have to be considered. A dirty shell not only spoils the appearance of an egg, but bacteria from the dirt may penetrate the pores of the shell and affect wholesomeness and flavour especially if, as is frequently the

case, the eggs are damp as well. Dampness, in any case, is liable to produce mould spots inside the shell, and these impart a musty flavour. For this reason, buyers do not favour eggs that have been washed, but prefer naturally clean eggs. Producers can obtain this with reasonable assurance by the use of suitably constructed nests and by the frequent changing of nesting material and floor litter. It follows, too, that stained eggs are of poorer quality than eggs carrying surface dirt, as stains indicate contact with moisture. Moreover, washing removes the coating on the shell, and destroys the bloom so characteristic of freshness; this also impairs the keeping qualities of the eggs. Excessive handling also destroys the bloom, as well as the interior quality; the trade and not the producer is usually responsible for this. One other shell quality of importance must be mentioned, namely, that of thickness and strength. Some hens lay eggs with thin and exceptionally porous shells, and there is ground for the belief that eggs from poorly-bred hens, which have been forced for heavy production, show this more frequently than eggs produced under normal conditions.

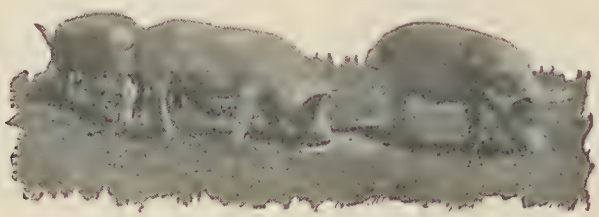
(H. F. Clinton,
Poultry Expert.)

### *Bee-keeping*

Towards the end of the month the urge to swarm, which is nature's provision for increase, will be fairly general in apiaries throughout the State, and some action should be taken to prevent losses caused by absconding swarms or at least to reduce the possibility of such losses to a minimum.

For the commercial bee-keeper with apiaries some distance apart, where constant and effectual supervision is not possible, the use of autumn-reared young Italian queens bred from stock showing a lack of the swarming impulse may prove to be the most satisfactory method. Hives thus equipped, provided ample room is made available by means of adding extra supers and combs as the strength of the colony increases, rarely cast a swarm during the first year of the queen's existence. Should an increase in the number of colonies be desired, this can be done and a measure of swarm control obtained at the same time by adopting the following method. Select a strong colony for the operation, move the hive a few feet to one side, and replace it with a hive containing frames of comb or full sheets of foundation. To this hive transfer the queen and three frames of brood, and place the lid in position. Returning field bees will be sufficient to carry on the new colony until reinforced by the emergence of young bees from the brood. Frames removed to make room for the brood can now be placed in the parent hive, a screen nailed in the top, and the entrance closed ready for removal to another apiary. On arrival, the parent hive should be placed in position and the entrance opened. Twenty-four hours later, if available, a matured queen cell, or a young mated queen should be introduced. If neither cell nor queen is available, an inspection of the brood should be made seven days later. Under normal conditions, a number of queen cells, raised by the bees, will be noted. One should be selected to provide the future mother of the colony, and the rest destroyed. If more than one queen cell is allowed to remain in the hive there is always the possibility that the first queen to emerge will create a swarming impulse thus defeating one of the objects of the division.

(J. W. Thomlinson,
Apiary Inspector.)



# SOIL DRIFT CONTROL

## Results of Competition—1944-45

Report of the Judge—HAROLD HANSLOW, Commissioner, State Rivers and Water Supply Commission

A dust storm about to envelop the Mallee town of Redcliffs.

ALTHOUGH the cost of cleaning drift soil from the State Rivers and Water Supply Commission's domestic and stock supply channels in the Mallee averages £72,000 per annum, a much greater sum was lost to the State each year by progressive reduction in soil fertility due to wind erosion. This naturally results in a production decrease from affected land and a corresponding fall in land values. As the districts are rated on the net annual value, this reduced the amount of revenue available to maintain channels and keep them free from soil drift to enable water to be delivered to towns and farms. It was not practicable to raise the rates on farms from which incomes are falling. Prevention of erosion was the obvious solution. This led to consideration being given to the holding of a Soil Drift Control Competition to create interest and obtain details on the methods used and results achieved, for publication and issue to farmers generally. Five Shire competitions and the Championship are held each year. The rules provide that the winner of the Shire Competition shall not be eligible to compete in the Shire Competition in the following year, but he may compete for the Championship Cup. The winner of the Championship Cup cannot compete in the following year.

An endeavour is made each year to convey to competitors and other Mallee farmers the impressions gained by the judge as to the greatest causes of soil drift and the best methods of prevention. One of the commonest causes of drift, in the writer's opinion, is overstocking with sheep. Three of the competitors' farms carried cattle and the difference between these holdings and those carrying sheep was most noticeable. Sheep eat very close to the surface and pull grass up by the roots. They will eat almost anything when

forced to, their small sharp hoofs cut up the soil and when going to water, they follow the same tracks from which a blow often starts.

Bare ground will blow easily. A certain amount of grass or stubble, even if merely lying on the surface, will hold the soil. When this stage is reached however, the time has arrived to move the sheep, or soil will be lost. Any loss suffered by the forced sale of sheep at this stage would not compare with the serious reduction in value of the farmer's property if he held the sheep up to a point where the soil began to blow away. Even then there is a chance that the farmer will lose not only his soil, but his sheep as well. He may buy more sheep but cannot bring back the soil that has blown away.

Ridging a bare paddock at Nullawil to retard drift.

The short term lease frequently is an indirect cause of soil drift, the lessee not making any effort to conserve the land while making money out of it. Fire is another cause. When nature was in a state of balance the Mallee scrub returned its leaves, twigs, and bark to the soil. Later, when the trees died they also went back to the soil. Settlers burnt the Mallee scrub, grew wheat and burnt the straw. They then broke up the ground and repeated the procedure again and again, continually destroying the humus and breaking down the mechanical structure of the soil. The penalties for all these abuses are being exacted now in widespread loss of soil.

Paddocks were seen in the Mallee this year well covered with two-years-old stubble from which there had been no drift, while nearby paddocks bare of stubble were badly blown. Mr. Hofmaier of Rosebery, who does not burn stubble, has proved that the ploughing in of stubble pays. His crop returns for the past four seasons were as follow:—

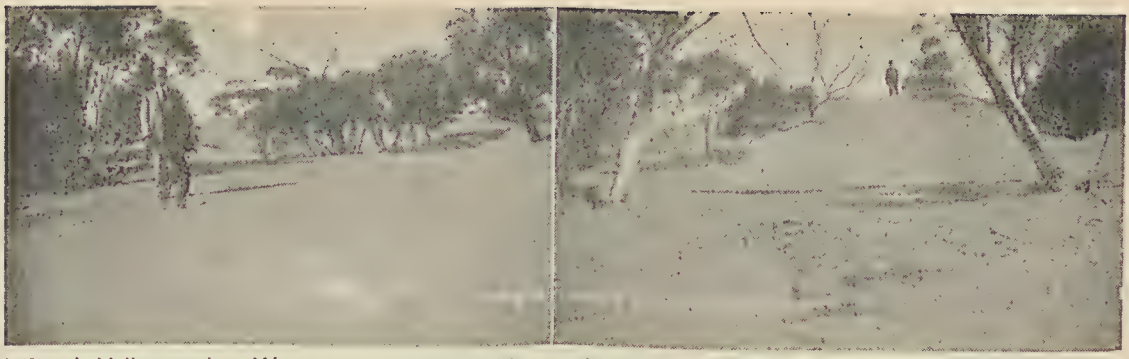
| | | |
|---|---|---|
| 1941 | .. | 10,500 bags from 1,000 acres. |
| 1942 | .. | 27 bushels per acre. |
| 1943 | .. | 21 bushels per acre. |
| 1944 | .. | 10 bushels per acre. |

One farmer not being able to get his "combine" through the straw last year raked it into windrows and burnt it. He pointed out that in every spot where straw had been removed the soil had blown away. A disc cultivator with seeder attachment or a double-disc harrow with a combine from which the tynes were removed, placed between the rows of discs as used by Mr. Hofmaier, is ideal for sowing in heavy stubble.

During the tour of inspection many sandhills were seen, completely bare of soil. The tops of such hills should never be fallowed. They may be cropped, but should not be worked until there is sufficient moisture to make the seed germinate and they should never be grazed bare.

One lesson learned from this and previous competitions is that light land should never be fallowed unless a firm grass sod or stubble can be turned down. If this cannot be done a crop of oats should be sown and stripped; then there will be straw to plough in to hold the fallow.

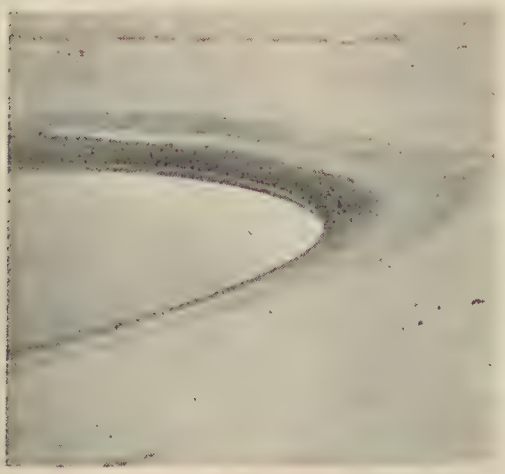
An example of what can be done in a drought was seen in a paddock near Nyarrin. A grass paddock eaten bare was starting to blow badly, when the owner ploughed it deeply in October leaving it very rough and lumpy. It was then holding well. An examination late in April showed that though it had weathered down, it was still holding.



Left.—A Mallee road at Werrimull, completely obliterated by sand. Right.—Another section of the same road.

While examining one of the competitor's farms of nearly 3,000 acres where few blown spots could be found it was noticed that a neighbour's soil was drifting over the cultivation. Examination of the neighbour's paddock revealed that the surface soil of nearly the whole paddock had been blown away down to the plough sole. The metal road alongside this same paddock was impassable, traffic having to detour for five chains into the opposite farm over fallowed land to avoid the deep sand drifts. Along another side of the same paddock the water channel was full and the culvert over the road was buried. The dam on the property had much drift soil in it and there were four dead sheep on the bank that had been bogged in the dam. There are many such places.

A most vital factor on a farm is its water supply. Many dams in the Mallee are silted-up with a large amount of drift soil containing organic matter which has polluted the water, turning it green with a strong, objectionable odour due to the presence of algae, a minute plant growth. It is suggested that such water may be made more palatable to stock by dissolving copper sulphate in water and evenly distributing it in the dam. Mix one ounce copper sulphate in one gallon of water and use one pint of the solution to each 1,000 gallons of water. If the water again turns green the treatment could be repeated.



A dam gradually being filled with drift-sand.

It is much easier to keep drift out of a dam than to clean it out. This could be done by placing a fence two chains out from the dam and making an approach on the lee side and corduroying it well into the dam. Ryecorn planted between the fence and the dam would also reduce drift, and in bad years furrows ploughed outside the fence would catch the soil. Mr. Hofmaier of Rosebery had very deep furrows ploughed every five yards for about five or six chains out from the dam, with the result that no drift had reached it.

After two drought years, soil drift over large areas of the Mallee had been very severe. Travelling on main roads was bad enough, but elsewhere road travel was impossible in many places and detours had to be made through farms.

### The Competition.

This year there were 29 entries, covering 42,000 acres, necessitating 1,100 miles of travel to judge them. A start was made from Hopetoun on the 17th April, 1945, to judge the Karkarooc–Dimboola section of the Competition. All the farmers in this section are doing a fine job and a farmer has to be good to secure a place in the competition. This year was a severe test owing to the drought. Nevertheless some excellent results were shown. Some farms had practically no drift at all. One of the most pleasing features of the whole judging was the manner in which competitors were prepared to draw attention to where

A lump of hard soil indicating the amount of soil blown from this paddock.

they had failed to hold their soil, proving it was the competition and not the prize in which they were most interested.

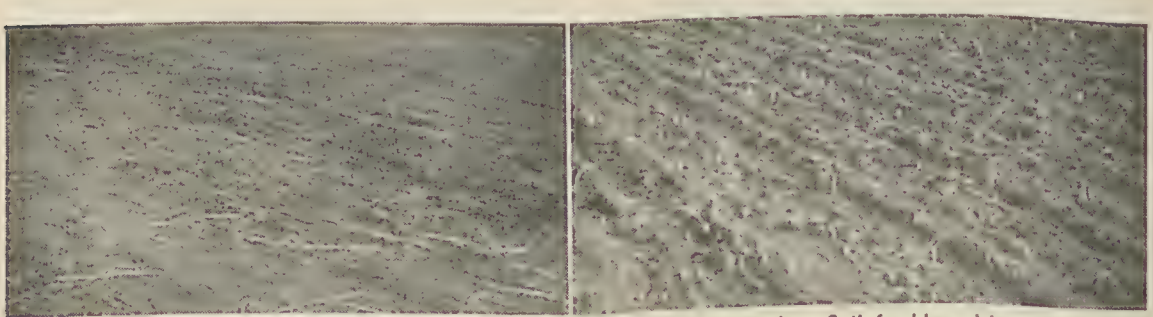
Mr. F. J. Hofmaier, who won the Karkarooc–Dimboola Section last year again showed an excellent exhibit. As stated in last year's report, this competitor favours working the stubble back into the soil and not burning it. The way the land is being held to-day proves the soundness of this practice. The evidence of previous drift before Mr. Hofmaier bought the property shows how badly this country can drift. This year some of the grass paddocks started to drift and were cultivated in December and left well-ridged and cloddy. They are now holding well. Land where hay had been cut had also started to drift. It was then successfully held by deep furrowing and ridging with a road plough, the ridges being made about five yards apart. The dams had been protected in a similar manner for about five chains out. The channels and dams on Mr. Hofmaier's farm were free of drift. There were ample supplies of fodder on hand. This year 420 acres of wheat were harvested for a ten bushel crop. The fine plantation and garden around the dwelling show how attractive a Mallee home can be made.

Mr. T. A. Clugston of Brentwood showed that by using similar methods he had beaten the drift, although evidence of drift in previous years could be seen. This competitor also had a fine garden and a home well-protected both by plantation and natural bush. Quite a good deal of furrowing and ridging of land likely to move had been done.

Petschel Bros. of Hopetoun also presented a fine exhibit. Going over their farm one would be excused for believing that the land did not drift, until paddocks nearby had been inspected.

Mr. Barbary of Woomelang was unfortunate in that he had to be away from his property in December when the drift got away a little, but he has to be commended for the determined effort he has made since then and has checked any further drift. This farmer had furrowed 800 acres very closely. The same applies to Mr. A. H. Schack of Gama who also had to be away from his property for some time. Mr. Schack has a light hilly property, hard to hold, and had made a commendable effort by furrowing and cultivation methods. The furrowing is of little value unless big clods can be turned up to catch the drift. In the sand where this could not be done, Mr. Schack examines the hills after every storm and places brush in each hole that has started to blow. In lopping the Mallee for this purpose, care is taken to cut the brush five or six feet from the ground so as not to exhaust the supply.

In the Wycheproof–Kerang section Mr. A. W. Mesley of Beauchamp provided an excellent exhibit. The lands that were cultivated were well-ridged and in a cloddy condition and



Left.—A good covering of stubble is an excellent preventive of "drift". Right.—Soil freshly cultivated with the stubble worked in.

A small green bush with the roots exposed showing the depth of soil recently blown away.

holding well. All other paddocks had good grass or stubble cover on them. Mr. Mesley recognized last spring that to remove any more cover from his land would leave it unprotected, so he sold 300 ewes with lambs at foot. Here again is an example of a well-protected home and a splendid garden with a fine plantation of sugar gums.

In the Swan Hill section Mr. W. A. J. Pearse and Mr. A. G. Pearce both had good entries. The last named runs cattle and no sheep. The former had retained his cattle but sold his sheep early last spring. The effect of removing sheep early by the three last mentioned farmers had made a great difference in the holding of their soil.

Mr. W. H. Jilbert of Ultima who had much land eroded in the past is making a determined and creditable effort to bring this land back into production. With a road plough he has ploughed furrows about a foot deep and about 6 ft. apart at right angles to the wind over 380 acres of his land. It is remarkable the amount of drift he has caught from other farms.

Mr. Sinclair of Swan Hill, in order to get feed for his stock, leased land in the irrigation area and put in fodder crops there. While away, his home property started to drift. He, too, had made a great and successful effort by furrowing and ridging with a single furrow plough to prevent further drift.

In the Mildura shire where the drought was most severe, the fallows were not sown in 1943 nor 1944 and farmers were still waiting for rain to sow this year. The drift here had been severe but A. J. Brown and Son of Carwarp have done a remarkably good job under the conditions prevailing. They also were ploughing deep furrows and ridges to stop the drift.

In the Walpeup Shire which also had a severe drought, Messrs. F. W. and F. Boettcher of Murrayville had made a determined effort by furrowing to prevent drift, having ploughed over 80 miles of furrows. Drift also was minimized by the action of Mr. Boettcher Senior, who disposed of his sheep in time to leave sufficient cover on the land. Both competitors are doing a good job.

Drastic measures had to be taken in this drought year to hold the soil. That is why so much reference has been made to furrowing and ridging. This treatment should not, however, be considered as normal practice in good years, but should be looked on as an emergency measure to be used when other methods fail owing to adverse seasonal conditions or other causes. In conclusion the writer wishes to again impress on farmers the wonderful value of stubble or any vegetative cover left on the ground to prevent drift. [*Continued on page* 446

A paddock near Swan Hill showing badly blown patches in the background.

# IN THE ORCHARD

By G. W. GAYFORD, B.Agr.Sc., Horticultural Instructor

## *Why Fruit Falls off Trees.*

OF all the troubles which occur in fruit trees, one of the most exasperating is the loss of a large proportion of the potential crop soon after blossoming. The following notes describe how this occurs and what measures may be adopted to prevent it.

The amount of blossom produced by a fruit tree is usually far in excess of that required to produce a normal crop. An apple tree, for instance, may set only from 10 to 20 per cent. of the flowers, the remainder falling off immediately after flowering. A further fall of young fruit occurs two to three weeks after flowering, these being unfertilized. The fall of small immature fruit ¼ to ½ inch in diameter, which occurs still later is a normal occurrence and should thin the crop out to normal size. This drop may be extensive under certain conditions and may severely reduce the crop. Such conditions are fairly rare, however, and with some fruit varieties such as the Yates apple and the Winter Cole pear, it is usually very small and additional hand thinning is necessary to obtain fruit of a size large enough for market.

Factors which increase the tendency to drop include faulty or inadequate pollination, poor tree health, inadequate supplies of water and nitrogen.

### Pollination.

The falling of fruit from the tree is caused by the development of an abscission layer of cells in the stalk. In other words, two adjoining layers of cells no longer adhere to each other and consequently the fruit is no longer supported. This abscission layer is quite a normal development in ripe fruit, but may occur when the fruit is immature. As long as there is a sufficient supply of plant hormone in the fruit the abscission layer is not formed and the supply of this hormone is thought to be partly dependent upon the development of the ovary containing the seeds. It is found that fruit with partly developed ovaries drop more extensively than those with every seed fertilized. The importance of adequate pollination in retaining the fruit can therefore be seen. Provision of cross-pollination in fruit such as apples, plums, pears and almonds is essential if crops are to be carried through to maturity. Inadequate pollination may also be due to lack of bees to carry the pollen. Cold showery weather during the blossoming period may reduce activities of bees. Such conditions sometimes occur during the blossoming period of early flowering fruits such as almonds, peaches and apricots, and may have a considerable effect on the size of the crop retained by the tree.

### Damage to Trees.

It is noticeable that fruit which is surrounded by large healthy leaves is held more strongly than fruit which is adjacent to small, diseased or damaged leaves. Adequate manuring, disease control and protection against windstorms should prevent these conditions. Fruit which is ¼ to ½ inch in diameter is very susceptible to damage by frost. The seed is usually damaged before other parts of the fruit and this would result in shedding of the fruit. The seeds of apples and pears may be damaged by codling grubs and this also causes young immature fruit to drop.

### Nitrogen Supply.

If the tree is deficient in nitrogen, it will be unable to retain the fruit to the same extent as a tree well supplied with nitrogen. If nitrogenous fertilizers are available, application two to three weeks before blossoming will reduce the drop.

### Water Supply.

An inadequate water supply to the tree will increase the tendency of fruit to drop. The deficiency of moisture may be temporary only and occur during the warmest part of the day. For instance, the root system, damaged due to a very wet winter, may not be able to supply sufficient water during periods of hot weather. Similarly, if a tree has a restricted root system through being planted in a shallow soil, a moisture deficit may occur. Under a restricted water supply and a high rate of moisture loss, the leaves can draw on moisture from the fruit, resulting in its abscission.

If the inadequate moisture supply is due to dry weather, watering the trees during and after blossoming may be necessary. If the root system has been damaged, severe pruning will reduce the amount of leaf area and therefore the amount of moisture lost from the tree. This would assist the tree to retain a reasonable crop of fruit.

# Vegetable Growing on the Koo-wee-rup Swamp

By A. C. DOERY, B.Agr.Sc., Agricultural Research Officer

The impetus given by the war to vegetable growing in Victoria is nowhere more marked than in the Koo-wee-rup district. Potatoes comprised the main crop grown there prior to the war, and vegetables such as carrots, beetroot, cabbages and parsnips were regarded as minor crops. In the 1943-44 season however, the acreage of carrots alone had increased to more than 1,500 acres, while the other "minor" crops had also expanded considerably.

With a soil of high fertility, a reasonably reliable rainfall and proximity to markets, the district has marked potentialities for vegetable production. The Swamp, which was drained late last century, includes the largest extent of reclaimed peat in Victoria. The soils are naturally fertile and, from a cultivation point of view, can be classified into three main types which are described in the following article.

THE Koo-wee-rup Swamp is approximately 100,000 acres in extent. Located in Gippsland, within fifty miles of Melbourne, its boundaries broadly are, the main railway line between Pakenham and Longwarry in the north, the shores of Western Port from Tooradin to Lang Lang in the south and lines drawn from Pakenham to Tooradin and Longwarry to Lang Lang in the west and east respectively.

The average annual rainfall of 30 inches is fairly evenly distributed throughout the year, except in January and February, when the falls are lighter and more erratic.

*Mean Monthly Rainfall at Koo-wee-rup for the Period* 1902–1940.

| | | | |
|---|---|---|---|
| January | 171 | July .. | 257 |
| February | 170 | August .. | 273 |
| March .. | 237 | September | 279 |
| April .. | 240 | October .. | 300 |
| May .. | 258 | November | 250 |
| June .. | 270 | December | 249 |

Total rainfall for year 2,954 points.

Cold conditions with frequent frosts limit plant growth during the winter, while isolated very early and very late frosts have occasionally damaged potato and maize crops.

## *Soil Types*

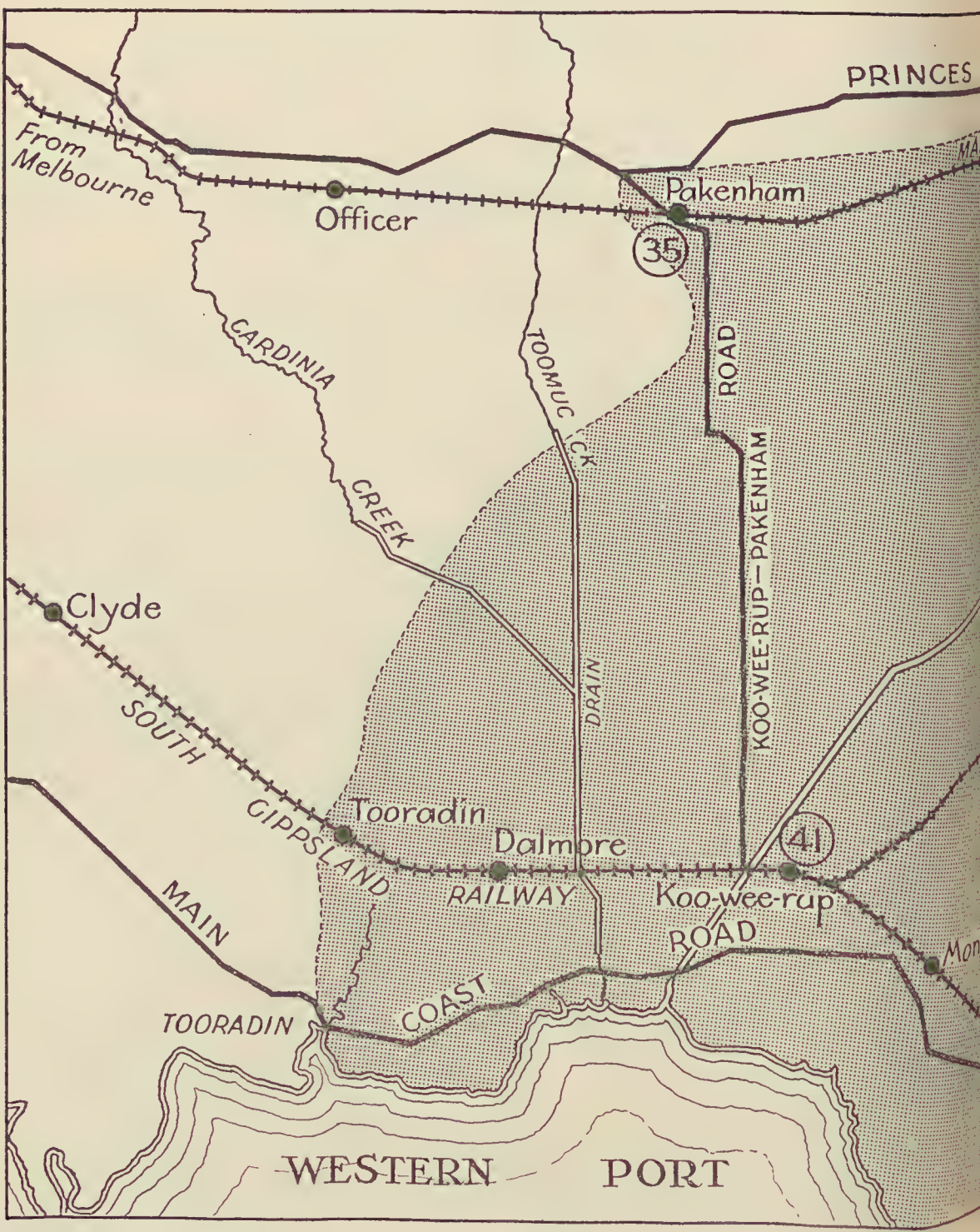
**Dalmore Clay.**—Confined to the Dalmore locality, this soil is particularly fertile. It is black and consists of a deep clay with a high percentage of organic matter which is responsible for its free working nature. Although it has a capacity to hold moisture throughout a dry season, Dalmore clay soil seldom becomes waterlogged. In the Rythdale area north of Dalmore the land is heavier and not as well drained.

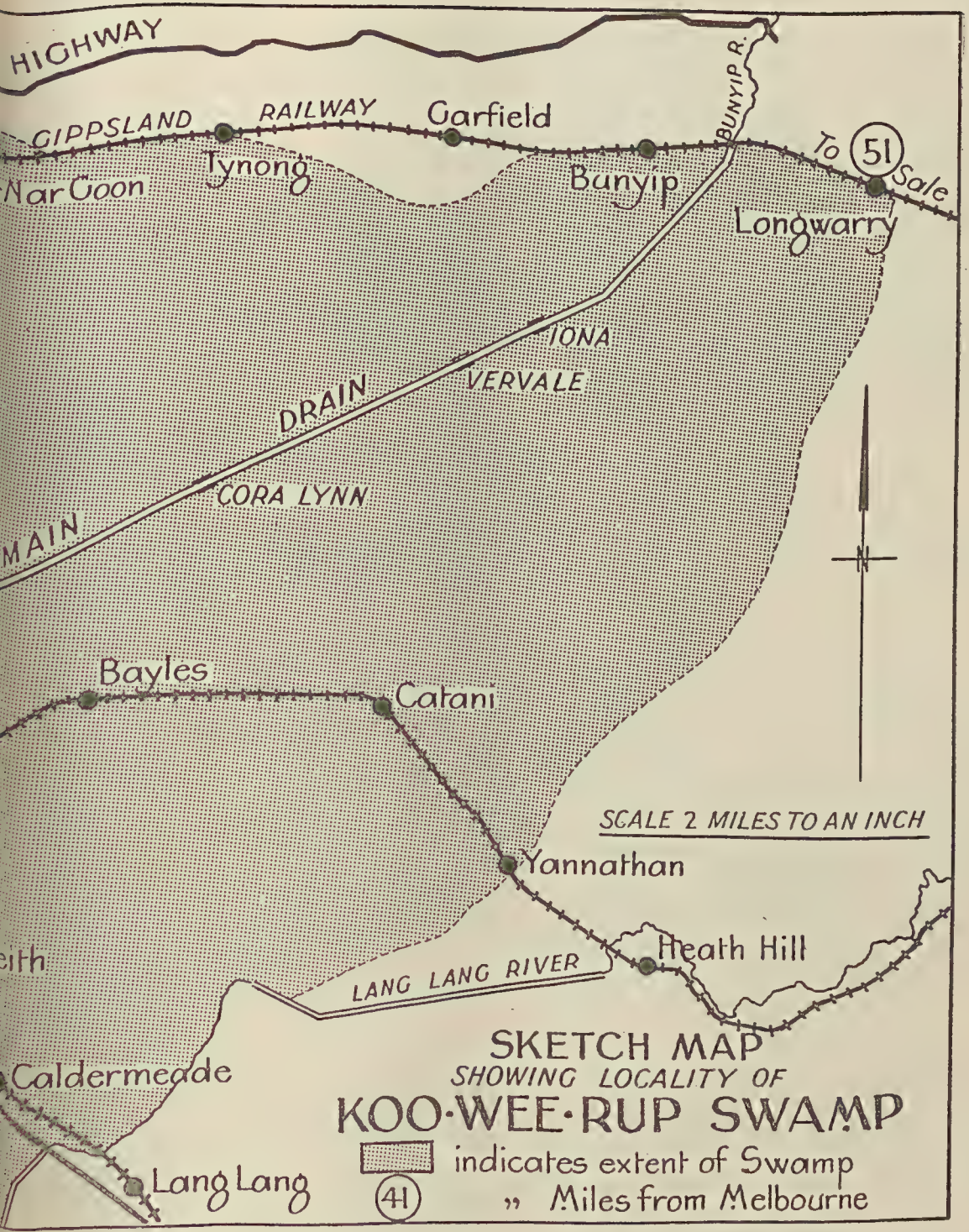
**Swamp Fringe.**—Located in the Bunyip-Iona district, along the northern boundary of the Swamp between Tynong and Pakeham and near Koo-wee-rup township, the Swamp Fringe Soil type covers a much larger area than the Dalmore clay type and consists of a grey, clay-loam of fairly high productive capacity.

**Koo-wee-rup Peat.**—Covering a large proportion of the remainder of the area the Koo-wee-rup Peat Soil type extends along both sides of the main drain from Iona nearly to Koo-wee-rup. There is also a section between Iona and Cora Lynn which extends south to Catani. The soil is grey in colour and of a free working nature due to the presence of large quantities of free peat. If the winter rains have been light there is a tendency for the top two or three inches of soil to become dry and "fluffy" in the summer months, and for this reason it is sometimes difficult to obtain a satisfactory "strike" with the small-seeded crops.

Although the soils of the Swamp are naturally of high fertility and organic content, care is needed if these excellent qualities are to be maintained. On certain farms under conditions of intensive culture, the land has become difficult to work and the soil tends to run together after rain. These conditions can be prevented, however. The more experienced growers regularly plough in green crops such as peas and oats, or rest their ground from intensive working by sowing pasture and allowing it to be grazed for a few years.

[*Continued on page* 432.


PRINCES
From Melbourne
Officer
Pakenham
35
CARDINIA CREEK
TOOMUC CK DRAIN
ROAD
KOO-WEE-RUP—PAKENHAM
Clyde
SOUTH GIPPSLAND RAILWAY
Tooradin
Dalmore
41
Koo-wee-rup
ROAD
MAIN COAST
TOORADIN
WESTERN PORT


HIGHWAY
GIPPSLAND
RAILWAY
Garfield
BUNYIP R.
To 51 Sale
Tynong
Bunyip
Nar Goon
Longwarry
IONA
VERVALE
DRAIN
CORA LYNN
MAIN
N
Bayles
Catani
SCALE 2 MILES TO AN INCH
Yannathan
Heath Hill
LANG LANG RIVER
SKETCH MAP
SHOWING LOCALITY OF
KOO-WEE-RUP SWAMP
indicates extent of Swamp
41
" Miles from Melbourne
Caldermeade
Lang Lang

The "Meeker" harrow is an ideal implement for the final working of the soil before sowing.

Potatoes are grown throughout the whole Swamp area, but other vegetables are confined mostly to the two first-mentioned soil types in the Dalmore and Bunyip localities. However, cabbages do well on the lighter peaty soils between Iona and Catani.

### *Machinery*

Since the vegetables in the area are produced on the broad-acre scale, and the land is flat, there is considerable scope for the mechanization of most operations. Most of the implements used in the preparation of the ground for planting are tractor drawn; while the sowing of small-seeded crops is frequently done with the push-type of single-row drill of the Planet Junior design, the Dutch hoe being used for subsequent workings. However, for the man who plans to work 5 to 20 acres of these crops, the garden tractor is admirably suited. This machine, with its seeding and cultivating attachments, will sow or cultivate three drill-rows at a time and, is capable of cultivating close to the rows, leaving only a small area to be weeded.

For larger areas, the tractor fitted with the row-crop tool-bar for seeding and cultivating attachments is an economic proposition. With this machine four rows are worked at a time. Deep working between the rows with these implements leaves the soil in loose condition which permits full development of root crops such as carrots. This deep working is of considerable advantage in the Dalmore country and on such soils that compact readily. The value of a tractor with tool-bar is further enhanced by the fact that machinery firms supplying attachable for multi-row ... ing of potatoes. Power spraying attachments are available for both garden and the larger tractors.

Several workings with the point type of harrow may be necessary to obtain the fine tilth required for the sowing of small seeded crops. An improvement on the ordinary harrows has been achieved in the form of the "Meeker" harrow which consists of a wooden rectangular frame carrying a series of rows of vertically placed discs arranged both in front and behind a levelling board which runs across the centre of the frame. A final working with this implement removes surface irregularities and leaves a fine tilth ready for planting. The "Meeker" harrow can be efficiently used on a wide range of soils.

### *Vegetable Crops*

In this article it is proposed to discuss the growing of carrots, beetroot, parsnips, cabbages, onions, peas and sweet corn. Those interested in potato-growing will find a description of cultural methods and other information on this crop in the Department's bulletin "Potato Growing in Victoria". This booklet may be obtained on application to the Director, Department of Agriculture, Melbourne, C.2, for the sum of 1s., post free.

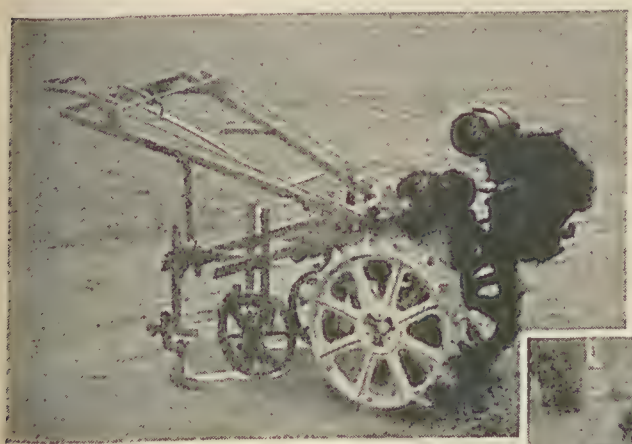
Experiments with vegetables are being conducted by the Department in different parts of the district, but these have not been proceeding for a long enough period for recommendations to be given, based on the results obtained to date. The methods described in the following pages are those which experienced growers have proved to be successful and well suited to the peculiar conditions found in the area.

*Soil Preparation.*—For spring sown crops, ploughing with a mould-board during the autumn allows the surface trash to be thoroughly turned under and become well rotted before planting. Carrot and parsnip land is best ploughed to a depth of 8 to 10 inches, while six inches is normally sufficient for other crops. Most of the Swamp soils are deep and will permit ploughing

as [illegible] above without bringing subsoil clay to the surface. Where pasture ground is being broken up, it is even more important that the initial ploughing be done during the autumn and in this case, the breaking up of the sod can be assisted by a working with the "cut-away" disc.

After ploughing, subsequent workings are done with the cultivator and harrows to check weed growth and improve soil texture so that a final run with the light harrows or "Meeker" is all that is necessary to leave the ground ready for sowing or planting.

Some growers plough a second time and at this stage opportunity is taken to work in the fertilizer for root crops.



Garden tractor fitted with one of the attachments used for inter-row cultivation.

**Carrots.**—Carrots are grown principally on the Dalmore clay and Swamp Fringe soils and are concentrated in the Dalmore, Koo-wee-rup and Bunyip–Iona localities.

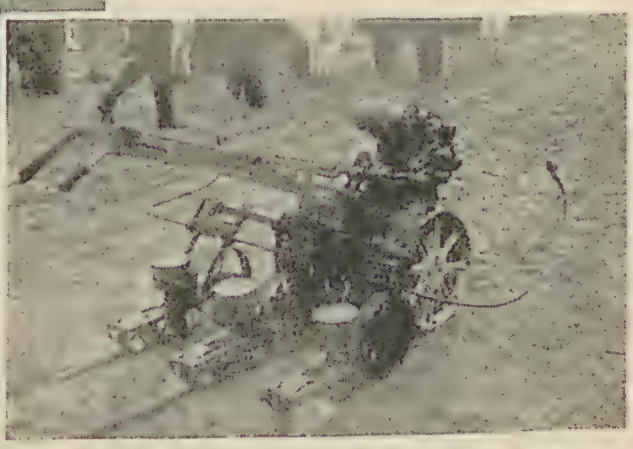
*Varieties.*—The outstanding variety for the main sowing is *Red Cored Chantenay* which is a heavy yielder and of high canning quality. This strain of Chantenay is typically a thick carrot which in normal seasons grows to a reasonable length, while in dry seasons it may be short, but it usually has sufficient width to be marketable. The main defect displayed by this variety under certain conditions is a tendency to crack when the root is near maturity.

The *Danvers* variety grows rapidly in the early stages, but is normally outyielded by Chantenay. Danvers has a good cooking flavor but the yellow core makes it unpopular for canning. In deep soils it tends to grow too long for easy handling.

Mention should be made of *Osborne Park* which has been introduced in recent years from Western Australia. This carrot is one of the few commercial varieties which is resistant to the carrot virus disease which is responsible for considerable loss in yield in the early-sown crops in this district. For this reason, Osborne Park is worthy of a trial by those growers who wish to supply the early market.

*Fertilizers.*—Superphosphate and Sulphate of Ammonia (6 : 1) mixture applied at the rate of 5 to 6 cwt. per acre and worked into the soil to a depth of about 6 inches has given very satisfactory results in the Swamp soils. A similar dressing of nitro-super has also proved adequate. Large yields of carrots have been obtained when sown without fertilizer after potatoes which are normally heavily manured. However, such a practice cannot be generally recommended with carrots where yields are high and large quantities of plant food are removed from the soil with the crop.

*Seeding.*—As well as the Planet Junior type of seeder, the two row onion drill (cup type) has proved very satisfactory in distributing the seed evenly along the drill



Garden tractor fitted with 3-row seeder attachment.

row. The seed is small and should not be sown deeper than ¾-inch.

Normal sowing time is during the months of October and November. While the Bunyip area is more suited to an October sowing, the Dalmore growers favour late October and November.

As indicated above, Osborne Park variety is worthy of a trial if an earlier sowing in September is attempted.

A satisfactory germination has been obtained with December sowings but frequently the young seedlings are "scorched" by hot winds which normally occur at this time of the year.

Seeding rates vary according to the width between the rows, 2–2½ lb. per acre are used when the rows are spaced at 9- or 12-inch intervals and when it is planned to thin out by hand. However, a sufficiently thick crop can be obtained by sowing at the rate of 1 lb. per acre in 18-inch rows, as is often the case when the crop is to be mechanically cultivated. Where the seeders are attached to a tractor a more even strike is obtained if the machine is driven slowly in low gear.

In a dense crop the plants are thinned out to 3 inches apart when they are 2 inches high. With lower rates of seeding, hand thinning is obviated.

*Weed Control.*—In the early stages the carrot plant grows slowly and is easily crowded out by the more aggressive weeds. Control of weeds, therefore, becomes of primary importance and measures to keep the crop clean must begin as soon as it is possible to detect the rows. Working between the drills is done either by the Dutch hoe or by the multi-row cultivator where the crop is sown by a multi-row seeder. Several cultivations may be necessary. There is no doubt that where large areas are to be cleaned, the most efficient and cheapest method to destroy weeds that grow in the row is by the use of the specially prepared Kerosene Weedicide. This is a selective spray, in that it will check most weeds and leave the carrot plant unharmed.

The advantage of controlling weeds by means of the selective spray is threefold, viz :—

1. A large area can be treated in a short time and the weeds checked at the correct stage.
2. The roots of the young carrot plants are left undisturbed.
3. Where weed growth is considerable, spraying is cheaper and there is a definite saving in labour.

When using kerosene as a selective weedicide, the following directions should be observed:—

1. Use only the Kerosene Weedicide specially prepared for the purpose.
2. Apply when the carrots have 1 to 4 "fern" or true leaves and do not spray within three months of maturity.
3. Use the weedicide neat and apply as a fine misty spray using sufficient to give a good coverage of the leaves of the weeds. Either knapsack or power sprayers can be used effectively.
4. Avoid spraying in very hot weather.

The quantity of weedicide required varies from 20 to 70 gallons per acre and depends on the type of spray pump used and the extent of weed growth.

*Harvesting.*—The main crop matures during the period from the middle of April to the middle of June, and the carrots are lifted by hand or fork. Where large areas are to be harvested the Sugar Beet lifter has proved a very efficient machine for lifting carrots grown in the widely spaced rows.

**Parsnips.**—Parsnips grow under similar conditions to carrots, but owing to the smaller demand, the acreage is considerably less and is concentrated almost entirely in the Dalmore locality.

*Variety.*—Virtually the only variety of parsnip grown on the Swamp is the Hollow Crown, although there appears to be a number of different strains. In the deep soils at Dalmore there is a tendency for this variety to become lank, with fine "whippy" ends. Growers who find this to be the case, would be well advised to follow the example of others who grow their own seed and select roots of a more blocky type for sets. In this manner it is possible to develop, over a period of years, a more attractive root and one that would be more easily harvested in deep soils.

*Fertilizer.*—The fertilizer applications are similar to those for carrots.

*Seeding.*—Parsnips are sown from late July to September, ½ to 1-inch deep in rows 12–18 inches apart, and the seeding rates range from 2–3 lb. per acre. The plants are thinned out to 4 inches apart in the row.

*Weed Control.*—After seeding, the main cultural operations centre around weed control and as with carrots, this is done principally by inter-row cultivation. Evidence is available that the Kerosene Weedicide can also be used without harm to parsnips, but as it has not been tested out extensively, growers are advised to proceed cautiously and try it out on a small area before spraying the whole crop. Spraying is done at the 2-3 leaf stage and in a similar manner as with carrots.

*Harvesting.*—Because of their length it is difficult to lift parsnips with a fork and the normal procedure is to plough the roots out with a single furrow moulboard. Potato ploughs have also been used for this purpose.

**Red Beet.**—Beetroot can be grown successfully almost anywhere on the Swamp, but there is no doubt that the yields are consistently higher on the heavier soil types

*Varieties.*—Detroit Dark Red is regarded as a high quality beetroot. It is of mid-season maturity and yields well. Normally the flesh is dark red and relatively free from white rings and consequently has a good appearance when canned. Early Wonder and Crosby's Egyptian are both earlier maturing varieties. However, the former variety frequently develops definite white rings and is not in demand by the processors. Both these beetroot have high yielding capacity.

*Fertilizer.*—An application of 4-cwt. of superphosphate and ammonium sulphate (6 : 1) mixture is worked in to a depth of 4-5 inches shortly before sowing.

*Seeding.*—Beetroot is sown from September to December and the seed is placed at a depth of $\frac{3}{4}$ to 1 inch in rows 12 to 18 inches apart. The seeding rate ranges from 5 to 7 lb. per acre and the seedlings are thinned to 4 inches apart in the row.

The large leaves of beetroot tend to smother other growth and weed control is not difficult and can be done by a few inter-row cultivations and very little hand work is necessary. The Kerosene Weedicide is not recommended as a selective weedicide in beetroot crops.

*Harvesting.*—The crop matures during the months February to April and can be easily pulled by hand.

**Onions.**—Onion growing is concentrated on the Dalmore soils and this is no doubt principally due to the fact that this crop requires a well drained soil in order to avoid rot developing in the bulbs.

*Varieties.*—The long keeping Australian Brown onion is the most popular variety on the Swamp while limited areas are sown with the Brown Globe.

*Planting.*—Some weeks before sowing the onion seed, rye corn or other cereals are sown in parallel rows about a chain apart across the paddock to act as wind breaks for the young onion seedlings. Growers generally favour sowing with the onion drill which is specially designed for the purpose. In this machine the seed is fed by a series of revolving cups into the tube and is distributed at regular intervals along the row. Onions are planted in rows 9 to 12 inches apart and normally the seed is placed at a depth of $\frac{1}{2}$ to 1 inch; although some growers obtain a satisfactory strike when the depth is increased to two inches.

The Globe variety is sown early in June, while early July is preferred for the Australian Brown.

*Fertilizer.*—The normal application of 5 cwt. of nitro super or superphosphate and ammonium sulphate (6:1) mixture which is frequently applied after seeding, is usually supplemented during the spring by a side dressing of 1 cwt. of nitrate of soda or ammonium sulphate.

*Weed Control.*—As the onion plant is slow in developing, it is necessary even before the seedlings emerge to hoe between the drill marks in order to check weed growth. Thinning and weeding in the rows is first done when the plants are 4 to 6 inches high. Recently a selective weedicide was tested on onion crops with promising results; but it will be necessary to make further tests with this material before definite recommendations can be made.

*Harvesting.*—The bulbs mature during the month of January and February and after skimming are left to cure on the ground for about four weeks, although a longer period may be necessary in showery weather. While the onions are on the ground, they are turned at intervals by means of light harrows in order to facilitate even curing. When the curing is complete the crop is bagged and stacked prior to being graded for marketing.

**Cabbages.**—Cabbages grow satisfactorily on all the main soil types of the Swamp, but as the bulk of the crop is produced under natural rainfall conditions there are only a few varieties which can be planted with a reasonable chance of success. There is considerable risk with varieties which normally mature or are transplanted during hot periods from January to March. Thus the selection is reduced to the Spring and Parisian cabbages.

The Spring type includes the conical shaped Eastham and Irish varieties which invariably develop hearts lighter in weight than the semi-flat Parisian.

The following details apply to the three varieties when grown under conditions that prevail on the Koo-wee-rup Swamp.

| Variety. | Sow Seed in Seed Bed. | Transplant in Field. | Distance between Rows. | Distance apart in the Rows. | Harvest Period. |
|---|---|---|---|---|---|
| | | | ft. in. | ft. in. | |
| Eastham | Late Feb. and March | April –May | 2 6 | 2 6 | Sept.–Oct. |
| Irish .. | March | May .. | 2 6 | 2 6 | Oct. –Nov. |
| Parisian | Mid May –June | Mid July –Aug. | 3 0 | 3 0 | Nov. –Dec. |

*The Seed Bed.*—The seed bed should be carefully prepared on a site where water can be applied if necessary so that the seedlings can be kept growing steadily until they are ready for transplanting. During the preparation of the seed bed, well rotted stable manure can be worked in or a light dressing of super and ammonium sulphate (4 : 1) mixture applied before the final working is beneficial.

Under wet conditions it is desirable to have the seed beds raised in the form of narrow lands about 5 ft. wide. A very fine tilth is necessary as the seed is small and is placed almost on the surface, certainly no deeper than ½ inch.

The seed is either broadcast by hand or drilled in rows about 5 inches apart and then lightly raked and immediately watered with a fine spray. The surface should be kept damp until the seedlings are well developed.

A seed bed 5 chains long and 5 feet wide is required for one pound of seed and this should provide enough seedlings to plant out about 3¼ acres.

The plants will be ready for transplanting in 8 or 9 weeks, when they should be 5 to 6 inches high. Watering should be reduced during the last week in the seed bed, in order to "harden" the young plants.

Owing to the prevalence of the cabbage butterfly and aphis in the autumn, it has become a normal practice to apply the combined nicotine and arsenate dust to the seedlings. It is also a sound practice to dust the plants immediately before lifting.

In selecting seedlings for transplanting, care is taken to avoid anything that is malformed, diseased or damaged by pests. The plants are lifted on the day of transplanting, tied in bunches and the roots trimmed with hand shears so that about 2 inches of taproot remains. The leaves are also lightly trimmed.

*Fertilizer.*—An application of super and ammonium sulphate (4 : 1) mixture at the rate of 4 cwt. per acre is distributed in plough furrows which are spaced to correspond with the rows of cabbages. The fertilizer attachment on the potato planter is ideal for applying the manure in this manner. When the leaves begin to turn over, a side-dressing of 1 to 1½ cwt. of nitrate of soda or ammonium sulphate assists in the development of the heart.

*Planting.*—Details of time of planting and spacing are set out in the table above.

The tobacco planter is well suited for the transplanting of cabbages especially because a small quantity of water can be applied to each plant, thus helping to bring the soil into close contact with the roots. With small areas the seedlings are dibbled in by hand. The plants should be placed immediately above the fertilizer when it is applied in furrows beforehand.

*Cultivation.*—The Scuffler type of implement is used for cultivating

Planting cabbage seedlings with a tobacco planter.

between the rows, and when the plants are small, the workings should be deep. As the plant grows, it develops a root system close to the surface so that each successive scuffling is shallower than the last. Cultivation ceases when it is difficult to move between the rows without damaging the cabbages. The hand hoe is then used to check weed-growth.

*Harvesting.*—It is preferable to harvest cabbages as soon as the heart becomes hard, because after this stage there is a definite deterioration in quality.

Loading pea vines with green-crop loader at Dalmore.

**Peas.**—Peas have been grown extensively in all parts of the Koo-wee-rup Swamp for many years. Originally, peas were grown for market, but more recently, with the establishment of a cannery in the Dandenong district, a new and more stable outlet was provided for the crop. Further, with the establishment in 1944 of another vining station at Dalmore, a considerably increased quantity of peas can be processed.

Peas intended for canning are normally grown under contract to a processor.

During the war, the importation of pea seed has been severely restricted, and a large proportion of the country's requirements have perforce been produced locally. Soil and climatic conditions in this area have proved suitable for the production of pea seed and by using modern threshing equipment an economic return can be obtained.

*Varieties.—Greenfeast* is popular as a mid-season market variety and because pods mature over a long period, a number of pickings are obtained from the one plant. On the other hand, because of this long maturing period, the variety is unsuited to the mechanized harvesting methods usually adopted with peas that are to be processed; also a better quality pea is required for canning.

*William Massey* (Melbourne Market) is an early maturing variety planted on a limited area for marketing purposes.

*Canners' Perfection*, is mid-season in maturity, a heavy yielder of good quality, and is widely grown for canning purposes.

A number of varieties recently introduced from overseas are reputed to be particularly suited for processing and these are being tested out locally in experimental plots.

*Fertilizer.*—The normal application of super is at the rate of 3 to 4 cwt. per acre but there are indications that this amount may be excessive and probably 2 cwt. per acre is sufficient on the more fertile soils.

*Seeding.*—Peas can be sown almost at any time during the year, although in winter, frost and cold checks growth. The sowing of peas for market is normally spread over the period from August to November in order to provide a succession of crops. The crop is sown in rows about 3 feet apart, the seed being broadcast with the fertilizer in furrows behind the plough.

For canning purposes, peas are planted according to a schedule prepared by the processor so that the harvesting is spread to provide a continuous run in the cannery. If the plantings are spread from August to early November the peas mature from October to January. September and October plantings are best suited for seed production, because the crop then matures during the months of December and January when conditions are normally satisfactory for threshing.

The crops for both canning and seed production are sown " broadcast " (in drills 7 inches apart) by means of the grain drill fitted with pea cups, to a depth of 2 or 3 inches. However, it is a

sound practice with late sowings or on dirty ground for the rows to be spaced about 24 inches apart to permit the use of the scuffler.

In " broadcast " crops, a cross harrowing when the peas are 2½ inches in height will help to check any weeds that have appeared.

*Harvesting.*—Harvesting the crop for canning purposes is done when the pods are just full, the peas a bright green colour and of sweet flavour. The harvesting process is mechanized throughout, the vines are cut by power mower, wind-rowed with a side delivery rake, loaded on to trucks with a green crop loader and transported to the vining station where peas are shelled and washed in preparation for canning. The crop is purchased by weight of green shelled peas.

When being kept for seed, the crop is left until the pods are of yellow parchment appearance before they are mowed and wind-rowed. After curing the vines are either stacked or threshed in the field by means of a header fitted with pea pick-up. If the field is free from weeds the crop can be harvested with a header with a pea front when the mowing and threshing is done in one operation.

**Sweet Corn and Asparagus.**—A survey of vegetable growing on the Koo-wee-rup Swamp would not be complete without some reference to Sweet Corn and Asparagus. At present the main outlet for both the crops is through the canneries with only a limited demand for the fresh products.

Sweet Corn requires warm conditions and is easily damaged by frost; the period during which it can be grown is therefore definitely restricted, and the areas where it is cultivated are those where very late and very early frosts rarely occur. The localities favoured are the higher parts of the Swamp near Bunyip and at Pakenham South, Dalmore and Rythdale.

Until recently, *Country Gentleman* was the predominating variety, but this has been displaced by the new American *Golden-Bantam* hybrid.

About ten pounds of seed per acre is sown at a depth of 1 to 1½ inches in hills with 3 ft. x 3 ft. spacing. A few growers have tried dibbling the seed so that the plants are spaced at 15-inch intervals in rows 3 ft. apart, but there is insufficient evidence at present to indicate whether this method is superior to the planting in hills.

A bag of nitro-super or super. and ammonium sulphate (6:1) mixture is applied by means of a fertilizer attachment on the planter. Subsequent operations consist of thinning where necessary, checking weeds by shallow scuffling and hoeing.

The cobs are picked by hand when the tassels have withered and the seeds are full but milky.

Asparagus thrives on the Swamp and does particularly well on the deep peaty soils of Cora Lynn and Vervale where large acreages have been maintained for a number of years.

It is not intended to give a detailed description of asparagus culture but suffice to say that from the raising of seedlings to the establishment of a profitable stand is a long and fairly costly procedure and growers would be well advised to arrange for the marketing of the shoots before embarking on the development of extensive areas.

It is of interest to note that a new development in vegetable production on the Swamp has occurred on areas adjacent to the main drain. By arrangement with the State Rivers and Water Supply Commission, some enterprising growers have pumped water from the drain in order to water vegetable crops by means of sprinklers. This has proved very successful because with water available throughout the year, the number and variety of vegetables which can be grown have been considerably increased. For example, profitable crops of Brussels Sprouts have been grown and Succession and Allhead cabbages could be planted with every chance of success.

The extent of this development is naturally limited by the quantity of water available and proximity of the farm to the main drain.

# WEED CONTROL IN AGRICULTURAL CROPS

## Selective Spray Trials

By ALAN R. RAW, M.Agr.Sc., Cereal Geneticist

For the past 50 years research workers have been experimenting with chemical sprays for the destruction of weeds in agricultural crops. Their aim has been to eliminate the costly and tedious process of weeding by hand or machinery. Shortage of manpower for rural employment during the war has accelerated this research both overseas and in Australia, and a number of tests have recently been conducted by the Victorian Department of Agriculture.

The following paper deals with trials conducted by the Department over the past two or three years with a chemical compound, sodium dinitro ortho cresylate, a derivative of coal tar, which is used extensively as a spray material in California for the control of weeds in crops such as onions, flax; and cereals.

The Victorian tests were conducted on flax crops at Dean's Marsh and Mt. Moriac, and on various crops at the State Research Farm, Werribee, with promising results which, as a whole, furnish a definite indication of the economic possibilities of the spray. At the same time, further intensive investigation into problems such as optimum concentration and dosage, time of application, atmospheric conditions at the time of spraying and other factors, will be necessary before any general recommendation can be made.

WEED control is a big problem for most farmers. This applies particularly to row crops, or those crops in which even a small percentage of weeds at harvest markedly reduce the value of the product. Suppression of weeds is expensive, whether achieved manually or by machinery, and adds greatly to production costs. If neglected, weeds will result in reduced yields and lowered values, and it has become essential if production is to be maintained at a payable level that some cheap and effective means of combating weeds be developed.

During the past 50 years a great deal of work has been done by research workers in an endeavour to solve the weed problem by the use of chemical sprays which will destroy weeds in growing crops without injury to the crop itself. Such sprays are termed "selective sprays" because they exert a differential or selective action on plants of different types, their effect being determined by the structure of the plant concerned.

Initial success was achieved by the use in cereal crops of spray solutions of copper or iron sulphate for the control of wild radish and certain other weeds. Later it was found that sulphuric acid in dilute solution was more effective than either of these sprays, and that it had a wider range of selectivity. Sulphuric acid has been successfully and largely used for the suppression of weeds in onion crops.

The acute shortage of manpower for rural employment during the war has been responsible for a tremendous acceleration in the development and use of selective sprays. A number of spray compounds have been evolved for the control of weeds in an extensive range of crops, and some of these have already been widely used as for example power kerosene as a weed-suppressor in carrot crops.

One of the more recent sprays which is extensively used in California to control weed growth in crops such as onions, flax, and cereals, is the chemical compound—sodium dinitro ortho cresylate. Derived from coal tar, the compound was originally evolved in France in 1933, and introduced into the United States of America, where it has been used successfully on a commercial scale for several years. Sodium dinitro ortho cresylate was introduced into Australia as a selective spray in 1943, and as such has already yielded exceptionally promising results in the treatment of weed-infested flax and cereal crops. The compound is differential in its action, its selectivity being due to differences in the structure of the foliage of the plants to which it is applied.

Onion leaves are cylindrical, upright and waxy, and in consequence, the droplets of spray either run off, or fail to penetrate to the vital tissues which form the new leaves. A similar structure is presented by the cereals and grasses which

also are not affected by the spray. On the other hand, many weeds such as wild radish and hoary cress have flat leaves lacking a waxy surface, and frequently covered with hairs which retain the spray. Furthermore the leaves are set in a more or less horizontal plane, and the growing point is exposed, rendering it susceptible to the action of the spray.

Sodium dinitro ortho cresylate is being manufactured in Australia by Timbrol Limited at Rhodes, New South Wales, and is being marketed under the proprietary name "Dinoc".

The weedicide should be applied as a fine spray using a knapsack spray or any type of power equipment. Directions for use are supplied with the compound and if these are strictly adhered to there will be little danger of damage to the crop. In general, the best results are obtained by spraying in warm, dry weather, when the crop is only a few inches high, and weeds are still in the cotyledon or early stages of growth. Since the spray has no residual effects a soil infested with seedling weeds may be treated prior to sowing the crop.

Care should be taken in handling the compound to avoid excessive contamination of the skin or clothing. Containers should be kept airtight, as the compound, although inactive in solution, becomes highly inflammable on drying out. Although the spray is not toxic in small quantities, it is inadvisable to confine stock on newly-sprayed areas.

Selective sprays are assuming an increasing importance in present-day agriculture, but while they present a relatively cheap and effective method of controlling weeds in growing crops, they do not furnish a complete substitute for cultivation. Their role is to reduce cultivation to a minimum, having regard to efficient crop production. By so doing they play an important part in lowering production costs.

In view of the promising results obtained in the United States by the use of the sodium dinitro ortho cresylate spray, it was decided to investigate its potentialities under local conditions, particularly in regard to the production of flax and cereal crops.

## *The Spraying Trials*

Exploratory spraying trials conducted at the State Research Farm, Werribee, during 1943, suggested the value of sodium dinitro ortho cresylate, as a selective spray for the control of weeds in cereal and flax crops. Tests were carried out late in the season when crops and weeds were in an advanced stage of growth. Using a concentration of 1 in 80, complete control of cape weed was achieved without damage to the crop.

During 1944, a further and more extensive series of investigations was carried out using the commercial preparation, "Dinoc", which is similar in composition to the "Sinox" used in the earlier tests. Plots were laid down at Werribee, Mt. Moriac, and Dean's Marsh. At Werribee, the trial embraced a relatively wide range of crop plants and weeds, but investigations at the other centres were confined to flax.

In all tests an application of 100 gallons per acre of a 1 in 80 concentration was selected as the standard treatment for comparison with unsprayed plots. Variations in concentration were included in order to determine the limits of effective economic dosage. Spray was applied by means of an ordinary "Rega" knapsack which was found to give an even distribution.

In general, the results were extremely promising and afforded confirmation of those obtained at Werribee during 1943. Details of the trials and of the results obtained at the various centres are presented hereunder:—

### Dean's Marsh–Mt. Moriac Tests.

Striking results were obtained from a trial conducted on the property of Mr. T. Hunt, Dean's Marsh. Here the flax crop, 4 to 6 inches in height was heavily infested with wild radish (*Raphanus Raphanistrum*), cape weed (*Cryptostemma calendulaceum*), and sorrel (*Rumex Acetosella*). At the time of spraying the radish was in the advanced rosette stage, some of the plants with a diameter of 9 to 12 inches. Cape weed was approaching the flowering stage. On this area a comprehensive trial embracing four replications of seven treatments, representing concentrations varying from 0 to 1 in 20, was set out.

Spraying at the rate of 100 gallons per acre was carried out on 21st of August, under warm, rather humid conditions. Census counts, made eight weeks after spraying, yielded the data presented in Table I.

All treatments were effective in controlling both radish and cape weed. Several varieties of thistle, including the ordinary Scotch thistle (*Onopordon Acathium*) and all varieties of clover were also destroyed. The spray was only partially effective in controlling sorrel, the extent of the damage caused varying from slight to extensive leaf burn. At the time of counting,

all plots carried a moderately thick undercover of native and introduced grasses, the majority having developed subsequent to spraying.

The effect of the different treatments on the crop was somewhat varied, but in general was reflected in markedly reduced population, and, to a lesser extent, in reduced yields. The reduction in population was accompanied by an increase in the diameter of the stem, but, with the exception of extreme concentrations, no variation was observed in straw length, measured from the base to the first branch.

The outstanding feature of the trial was the effect on the crop of the addition of sulphate of ammonia to the spray mixture (1 lb. of sulphate of ammonia per gallon of commercial "Dinoc"). All concentrations containing ammonia gave complete weed control, but caused an appreciable reduction in plant population and yield. The effect appears to be localized, and was probably due to atmospheric conditions at the time of spraying, since the use of ammoniated sprays, under the dry conditions prevailing at Werribee, was not accompanied by any adverse effect.

It was noticed that spray damage was greatest where the crop had been trampled and bruised at the time of spraying.

The most promising results were obtained by the use of a concentration of 1 in 80 without ammonia. In this case complete weed control was achieved without any appreciable effect upon yield. Confirmation of this result was supplied by observation strips laid down in a radish–capeweed infested crop on the property of Mr. H. R. Buckley, Mt. Moriac.

Under the extreme conditions of weed infestation of the crop at Dean's Marsh, the value of the spray as a commercial proposition was readily apparent.

### State Research Farm, Werribee.

The investigations at Werribee were chiefly of an exploratory nature, designed to determine the effect of the spray upon a wide range of crop plants and weeds. In all trials a 1 in 80 concentration applied at the rate of 100 gallons per acre, was employed. Except in the flax trials, ammonium sulphate was omitted from the spray. A general summary of results is presented in Table II.

In all tests the spray was applied without permanent damage to the crop concerned. This was particularly noticeable with the flax which was treated in all stages of development of the plant.

The effect of the spray upon Hoary Cress (*Lepidium Draba*), which is widespread at Werribee, is of exceptional interest. This plant apparently is extremely susceptible to the spray, and even low concentrations result in a complete killing of the leaves. The effect of the spray, however, is confined to the leaves, and does no more than administer a severe check to the plant. A similar degree of susceptibility is exhibited by cape weed, which is killed by concentrations, as low as 1 in 120. The spray will find a very definite application under special conditions, such as cereal and flax nursery plots, and in areas sown to row crops, where it will eliminate the necessity of hand hoeing.

As a result of the investigations at Werribee it was found possible to classify some of the more common weeds according to their reaction to the spray.

1. Complete Kill.

| | |
|---|---|
| Cape Weed | *Cryptostemma calendulaceum.* |
| Cress | *Lepidium sativum.* |
| Pepper Cress | *Lepidium hyssopifolium.* |
| Bathurst Burr | *Xanthium spinosa.* |
| Shepherd's Purse | *Capsella Bursa-pastoris.* |
| Radish | *Raphanus Raphanistrum.* |
| Mustard | *Sisymbrium officinale—S. orientale.* |
| Night Shade | *Solanum nigrum.* |
| Thistles | *Sonchus, Onopordon, &c.* |
| Poppy | *Papaver* sp. |
| Chickweed | *Stellaria media—Cerastium glomeratum.* |
| Vetch | *Vicia sativa.* |
| Fumitory | *Fumaria officinalis.* |
| Cotula Australis | |
| Dandelion | *Taraxacum officinale.* |

2. Leaf Kill, Partial to complete—Plants may or may not recover.

| | |
|---|---|
| Fat Hen | *Chenopodium album*—Complete kill in seedling stage. |
| Hog weed | *Polygonum aviculare*—Complete kill in seedling stage. |
| Sorrel | *Rumex acetosella.* |
| Marshmallow | *Malva rotundifolia.* |
| Burr Medick | *Medicago minima.* |
| Barley Grass | *Hordeum murinum.* |
| Amaranthus Sp. | Effect only slight. |

3. Leaf Kill, followed by recovery of the Plant.

| | |
|---|---|
| Hoary Cress | *Lepidium Draba.* |
| Dock | *Rumex* sp. |
| Plantian | *Plantago lanceolata.* |

Of the crop plants the following are unaffected by the spray under normal conditions:—flax, wheat, oats, barley, peas, onions, and grasses. On the other hand, rape, cabbage in the seedling stage, poppies, beans, lucerne, and clovers are very susceptible.

The effectiveness of the spray is largely dependent upon the age and condition of the plant. Generally speaking plants are more susceptible in the seedling stage or when they are grown under conditions conducive to the development of succulent tissues.

The results as a whole furnish a definite indication of the economic possibilities of the spray. At the same time, they suggest the need for further intensive investigation into problems relating to optimum concentration and dosage, time of application, environmental effects, and the role of additives such as ammonium sulphate and ammonium phosphate.

### *Summary*

Exploratory trials conducted at the State Research Farm, Werribee, during 1943 suggested the value of sodium dinitro ortho cresylate as a selective spray for weed control in cereal and flax crops. Further extensive trials at Werribee, Dean's Marsh, and Mt. Moriac in 1944 confirmed the 1943 results.

A 1 in 80 concentration of the spray applied at the rate of 100 gallons per acre gave complete control of wild radish, cape weed, and weeds of lesser importance, without damage to the main crop. Weaker concentrations were less effective in controlling weeds, while, on the other hand, higher concentrations exerted a lethal effect upon the crop.

The addition of sulphate of ammonia (1 lb. per gallon of spray compound), increased the effectiveness of the spray but, under certain conditions, rendered it more lethal to flax.

The effectiveness of the spray is dependent upon concentration, rate and evenness of application, environmental conditions—particularly humidity at the time of spraying, and the stage and condition of growth of the crop and of the infesting weeds. Plants which have suffered injury through crushing and bruising are especially susceptible to spray injury.

There can be no doubt regarding the economic possibilities of the spray under conditions of severe infestation of the crop by certain specific weeds but, before any general recommendation can be made, further research into problems of concentration, rate of application, atmospheric conditions at time of spraying, and the effect of activators such as sulphate of ammonia, will be necessary.

TABLE I.—SELECTIVE SPRAY TRIAL—DEAN'S MARSH, 1944.

Crop: Flax, 6 inches high. Spray: Dinoc ± Am-SO4

Rate of Application—100 Gallons per Acre.

Area heavily infested with radish, cape weed, and sorrel, some thistles, undergrowth of native flora (grasses, clovers, &c.). Some introduced grasses (Yorkshire Fog). Radish in advanced rosette stage.

| Treatment. | Plants per Foot. | Length of Straw. | Thickness of Straw. | Yield per Acre. | Percentage Reduced Yield. | Percentage Rubbish.* | Remarks *re* Weeds at Maturity. |
|---|---|---|---|---|---|---|---|
| | | in. | units | tons | % | % | |
| Unsprayed .. | 52·8 | 30·7 | 1·72 | 1·87 | .. | 23 | Radish infestation 38 per cent. by weight; heavy infestation cape weed, sorrel, thistle, grass, and subterranean clover |
| Dinoc 1 : 100 .. | 42·3 | 30·2 | 2·21 | 1·72 | 8 | 18 | Complete control of radish, cape weed, thistle, and clover; partial control sorrel; grass not affected |
| Dinoc 1 : 80 .. | 40·4 | 30·0 | 2·27 | 1·73 | 8 | 21 | |
| Dinoc 1 : 80 (no Am2 SO4) | 49·1 | 30·6 | 2·02 | 1·85 | 1 | 18 | |
| Dinoc 1 : 60 .. | 36·1 | 30·7 | 2·47 | 1·50 | 19 | 19 | |
| Dinoc 1 : 40 .. | 26·0 | 26·7 | 2·93 | ·88 | 53 | 19 | |
| Dinoc 1 : 20 .. | 3·1 | 21·5 | 3·32 | ·03 | 98 | 23 | |

* Rubbish consisting of undergrowth—native grasses, &c., which would not normally be harvested. Not included in yield per acre.

TABLE II.—SELECTIVE SPRAY TRIALS—WERRIBEE, 1944.
(Spray Dinoc 1 : 80 at 100 Gallons per Acre.)

| Crop. | Stage of Development. | Weeds. | Crop (Effect of Spray). | Weeds (Effect of Spray). |
|---|---|---|---|---|
| Wheat .. | 4 inches .. .. | Hoary cress, hogweed 4–6 leaved, vetch, capeweed | Very slight damage basal. No permanent effect | Hoary cress complete leaf kill; hogweed, vetch and capeweed killed |
| Wheat .. | 6 inches .. .. | Hoary cress, hogweed, and capeweed | Nil .. .. | Hoary cress complete leaf kill; hogweed partial kill; capeweed complete kill |
| Wheat .. | 12 to 18 inches—shot blade stage | Hoary cress, hogweed, and capeweed | Nil .. .. | Hoary cress complete leaf kill; hogweed partial kill; capeweed complete kill |
| Oats .. .. | Rosette stage .. | Hoary cress, hogweed, and capeweed | Nil .. .. | Hoary cress complete leaf kill; capeweed seedling complete kill; hogweed partial kill |
| Oats .. .. | Shot blade, crop hard stunted (Dinoc + Am2 SO4) | Hoary cress, capeweed, poppy, fumitory, cotula, hogweed | Slight damage to basal leaves; no permanent effect | Hoary cress complete leaf kill; capeweed, poppy, fumitory cotula complete kill; hogweed partial kill |
| Barley .. | Rosette stage .. | Hoary cress, seedling hogweed, capeweed | Slight damage to basal leaves; no permanent effect | Hoary cress complete leaf kill; partial kill seedling hogweed; capeweed complete kill |
| Barley .. | Shot blade .. .. | Hoary cress, seedling hogweed, capeweed | Nil .. .. | Hoary cress complete leaf kill; partial kill seedling hogweed; capeweed complete kill |
| Field Peas .. | 6 to 8 inches .. | Hogweed, hoary cress, and capeweed | Slight burning of basal leaves | Capeweed complete kill; hoary cress complete leaf kill; hogweed partial kill |
| Onions .. | Bulbing stage .. | Hoary cress, hogweed, and capeweed | Nil .. .. | Hoary cress complete leaf kill; hogweed partial kill; capeweed complete kill |
| | Dinoc 1 : 80 + Am2 SO4 1 lb. per gallon. | | | |
| Flax .. .. | 2 to 6 inches .. | Hoary cress, hogweed, capeweed, Bathurst burr | Nil .. .. | Hoary cress complete leaf kill; capeweed, Bathurst burr, milk thistle, subterranean clover, lucerne complete kill; hogweed partial kill (80 per cent.); marshmallow partial to complete kill; Burr medick, Wimmera rye, and barley grass severe damage |
| Flax .. .. | 1 foot .. .. | Hoary cress, hogweed, capeweed, milk thistle marshmallow, Wimmera rye, burr medick, barley grass | Superficial damage basal leaves | |
| Flax .. .. | Early bud to bud stage | Hoary cress, capeweed, hogweed, marshmallow, thistle, subterranean clover, burr, medick, lucerne | Superficial damage basal leaves | |

# COOL STORAGE OF POTATOES

By G. B. TINDALE, B.Agr.Sc., Cool Storage Research Officer, and
G. H. MATTINGLEY, Potato Expert

DURING the Pacific War, large quantities of vegetables were needed for the Allied forces. These perishable foodstuffs, which had to be transported long distances and stored for varying periods under tropical conditions, provided an excellent opportunity to test out the possibilities of dehydration, which process was fully exploited.

In order that canneries and dehydrating plants could be kept in full operation throughout the year, it became necessary to store certain vegetables, including potatoes, to provide for the between-seasons period of the year when supplies are comparatively light and of doubtful quality. Accordingly, quantities of potatoes have been cool-stored in Victoria during the last two years.

As little information was available locally as to the proper temperature to "cool-store" potatoes, and the effect that such cool storage might have upon the future utilization of the tubers, a small scale storage experiment was carried out in 1944. For the purpose of the experiment a ton of Late Carman potatoes grown on Ballarat red soil was put aside shortly after harvesting at the end of May. This bulk quantity was stored in bags in a shed on the farm in the normal way. During the months of June, July, August, and September, a quantity of tubers was taken from bulk and comparable samples were then stored under the following conditions:—

1. Cool stored at 32°F.
2. Cool stored at 42°F.
3. Stored in bags in a barn at Ballarat.

The cool storage was done in the experimental chambers at the Government Cool Stores, Melbourne.

All samples were weighed immediately before being placed in storage and the condition of the tubers was noted. The samples placed in store during the months of June, July, and August were in excellent condition, the tubers still being dormant. In September, however, small sprouts about 1/16th inch long were apparent on the majority of tubers. The potatoes were held under the various conditions of storage until the end of November, when they were examined and weighed.

From mid-September on, with the completion of the rest period of the potatoes and gradually rising atmospheric temperatures, the sprouts on the farm-stored potatoes rapidly developed, until by December they were over six inches in length. With the increasing development of the sprouts, the quality and appearance of the farm-stored potatoes progressively declined and by the end of the storage period they were wrinkled and shrunken.

On the other hand, the tubers held in cool store until the end of November opened up in a condition scarcely different from that when harvested. The potatoes held at 32°F remained absolutely dormant, while those kept at 42°F developed small sprouts no longer than 1/8th inch in length.

The following table sets out the percentage losses in weight incurred by the samples stored under the various conditions. The weight of the sprouts produced on the farm-stored potatoes, is included in the total loss of weight.

Table.—Percentage Loss in Weight Under Various Storage Conditions.

| Storage Period. | Conditions of Storage. | | | |
|---|---|---|---|---|
| | 32° F. | 42° F. | Farm Stored. | |
| | | | Total. | Sprouts. |
| | % | % | % | % |
| June 20—Nov. 27 | 8 | 8 | 21 | 10 |
| July 10—Nov. 27 | 4 | 5 | 20 | 11 |
| August 9—Nov. 27 | 5 | 5 | 17 | 10 |
| Sept. 12—Nov. 27 | 3 | 4 | 22 | 11 |

## *Discussion of Results*

### Loss of Weight.

(*a*) Cool store. The loss in weight incurred over the various storage periods was much the same for each temperature, the actual loss being in proportion to the length of the storage period. Potatoes stored from June to the end of November lost 8 per cent. of their original weight, while those stored from September to the end of November lost only half that amount while in

cool store. The latter would, of course, have lost some additional weight while being held in bulk from June to September awaiting cool storage.

(*b*) On the farm. It is of interest to note that the volume of sprouts produced by the lots stored for varying periods in the barn at Ballarat was practically the same in all cases. This was due to the fact that all sprouting took place after the rest period ended in the middle of September. The total loss in weight incurred by the farm-stored potatoes was approximately 20 per cent. or five times that of the tubers held in cool store from September onwards.

### Storage Temperature.

In so far as actual appearance of the cool-stored potatoes was concerned, while both lots opened up in first-class condition, the sample from the 32° chamber looked the better as they had remained quite dormant, whereas those held at 42° had produced small shoots about 1/8th inch in length. However, when cooking tests were made, the material stored at 32° possessed an unnatural sweet taste and was of a soggy nature. This condition is due to the conversion of portion of the starch content to sugars, and is brought about by prolonged storage at too low a temperature. On the other hand, the potatoes kept at 42° were normal in every way when cooked. While the latter temperature was sufficiently low to maintain the tubers in good condition and restrict sprout development to the minimum, it was still high enough to prevent the undesirable starch conversion from taking place.

Potatoes stored from June 20th to November 27th. Left—On the farm
Right—At a temperature of 42° F.

Samples of tubers held under various conditions of storage were submitted to Mr. W. R. Jewell, Agricultural Research Chemist, for analysis. He reported that "in the potatoes stored at 32° there was a marked conversion of starch to sugars, the sugar content being about four times greater than in the other two samples, corresponding to approximately a 30 per cent. conversion of starch to sugar. This confirms published overseas experience that prolonged storage at too low a temperature results in a conversion of starch to sugar, adversely affecting the culinary quality of the potato."

### Time of Storage.

As the farm-stored samples, when examined early in September, were equal in every way to the lots placed in cool store several months before, it would seem that cool storage is not warranted until after the end of August. Although, from a comparative point of view, the experiment ended on November 27, some of the samples stored at 42° were retained in the cool chamber until the following July, when they were still in good condition and cooked in a very satisfactory manner. As this represents nearly twelve months in the cool store, it is apparent that retention of potatoes for several months at 42° will not noticeably affect their value for table purposes.

## *Dehydration of Cool-Stored Potatoes*

At the conclusion of the experiment described above, representative samples of potatoes from the cool-stored and farm-stored lots were forwarded to the Division of Food Preservation, C.S.I.R., Homebush, N.S.W., for processing. On arrival the samples stored at 32°F were found to be crisp with no rotting or sprouting. The tubers were very sweet due to starch conversion and were cured at 77°F., for two weeks before processing. During curing, sprouting and conversion of sugar back to starch took place fairly rapidly, until finally the tubers had a sugar content slightly below normal. The potatoes stored at 42°F. were fairly crisp and showed very slight rotting and sprouting. The sugar content was normal. The farm-stored potatoes had had the excess sprouts removed and were flabby, with slight rotting.

After passing through the normal dehydration process, which with freshly dug, good quality tubers gives a product complying in all respects with Australian Food Council specifications, the initial quality of all the samples was fair to good. Moisture contents were fairly uniform but the samples ex farm storage were slightly higher than the others.

After storage for four months at 86°F. the dehydrated product from the farm-stored samples were all in poor condition and definitely inferior to all other samples. The product from each of the cool-stored samples were in fair condition with the exception of those stored from June to November.

### *Conclusions*

Cool storage of main-crop potatoes of the Late Carman variety is not warranted before the end of August, or until the potatoes approach the end of the winter rest period.

Cool storage temperatures in the region of 42°F. are recommended, as this temperature maintains the tubers in the best condition for culinary purposes for a period of many months.

When stored at 32°F., although they maintain an excellent appearance, the tubers deteriorate considerably in culinary value, due to conversion of potato starch to sugars. When cooked such potatoes are sweet and very soggy.

From the data supplied by the Division of Food Preservation, C.S.I.R., the following conclusions have been drawn :—

Freshly-dug, good-quality potatoes give the most satisfactory dehydrated product.

As the dehydrated product from cool-stored samples showed signs of deterioration after storage, potatoes intended for dehydration should not be held in cool store longer than three months.

**Acknowledgment.**

Thanks are due to Dr. T. M. Reynolds, Division of Food Preservation, C.S.I.R., who arranged the processing of the variously stored samples and who reported on their suitability for dehydration purposes.

## SOIL DRIFT CONTROL—*continued from page 427.*

The winners of this year's Competitions were as follow:—

CHAMPION AND WINNER OF THE CUP.

Mr. F. J. Hofmaier, Rosebery.

*Mildura Shire.*

1st A. J. Brown and Son, Carwarp.
2nd W. E. Kelly, Werrimull.

*Karkarooc and Dimboola.*

1st T. A. Clugston, Brentwood.
2nd Petschel Bros., Hopetoun.
3rd A. H. Schack, Gama.

*Walpeup.*

1st F. W. and F. Boettcher, Murrayville.
2nd R. Boettcher, Murrayville.

*Swan Hill.*

1st W. A. J. Pearse, Nyah West.
2nd A. G. Pearce, Nyah West.

*Wycheproof and Kerang.*

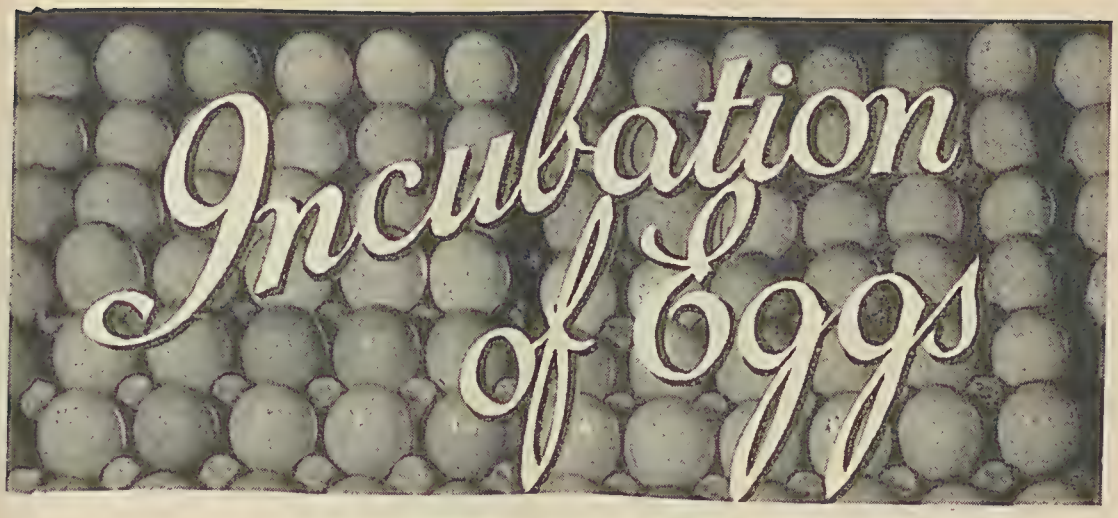
1st A. W. Mesley, Beauchamp.
2nd L. E. Hender, Nandaly.

CUP FINALISTS.

F. J. Hofmaier, Rosebery.
H. Ronde, Murrayville.
T. A. Clugston, Brentwood.
A. W. Mesley, Beauchamp.
H. G. Broad, Woomelang.
T. S. Callahan, Karawinna.
A. J. Brown and Son, Carwarp.

PREVIOUS CHAMPIONS.

1940–41 F. A. Meagher, Murrayville.
1942–43 A. H. Schack, Gama.
1943–44 W. Meagher, Murrayville.
1944–45 V. Watson, Nyah West.




By W. O. PEDERICK, Assistant Poultry Expert

THE advice given in this article applies chiefly to those poultry keepers who are using small types of incubators heated with kerosene lamps, but the main points apply to users of any type of incubator.

The incubation of chickens is one of the most interesting as well as one of the most important operations in connection with poultry keeping. It is interesting because of the fact that in twenty-one days the egg is changed from a delicate and highly nourishing article of food to a live active chicken which, if given nourishment and a favourable environment, is able to care for itself.

The poultry keeper depends chiefly upon pullets for the supply of eggs during the winter months. It is advisable, therefore, to replace a large proportion of the laying flock each year with young stock. This replacement makes the use of artificial methods of incubation essential. On most commercial farms it is estimated that, from every five or six eggs laid by the breeding stock, only one pullet is reared. Wastage occurs in the following ways :—For every six eggs gathered, one is discarded on account of size, shape or shell texture ; one is infertile ; and another contains a weak germ, and the chicken dies in the shell ; thus from every six eggs laid, five are placed in the machine, two are failures, leaving a 50 per cent hatch. From these chicks, after allowing for losses by death, accident and culling and 50 per cent. of cockerels, slightly more than one pullet reaches maturity, the proportion being about 25 per cent. of the eggs actually set down. These figures show how heavy replacement costs are and how necessary it is to attend to every detail that is likely to keep such costs down.

The successful hatching of chicks in an incubator depends on a number of factors, quite apart from the actual operating of the machine. Some of the factors which influence the hatch are :—Vigour of the breeding stock, their care and management, selection of eggs for hatching, storage of the eggs, the time when eggs are set, and incubation management.

### *The Breeding Stock*

The careful selection of breeding stock will eliminate many poor layers and weak individuals The selection should take place several months before the breeding season commences. This will give the poultry keeper an opportunity to prepare the birds for the season. Early moulters are looked upon with disfavour ; late moulters are usually the most desirable birds from which to breed.

During the moult the bird's reproductive organs have a complete rest, so that the first 20 or 30 eggs laid after the moult are the most likely to hatch good strong chicks. Hens used for breeding should be aged one year or over. Immature pullets will usually produce weak chicks which in turn will lay small eggs.

It is important to know how the male bird is bred. This bird should be well developed with plenty of constitutional vigour.

Feed the breeding stock well during the winter. In general, the ration for breeders is similar to that recommended for layers. Ample supplies

of good succulent green food and, if procurable, skim milk or dried milk products should be supplied. The feeding of milk and green feed is known to have a good effect on the stock and on their eggs.

The ideal breeding pen is one in which the birds are allowed free range. If the birds must be housed they should be allowed all the room possible, and be supplied with ample supplies of clean scratching material to provide exercise. The house should be constructed so that the direct rays of the sun may shine on the birds. Direct sunlight on the breeding stock has beneficial effect upon fertility and ultimate hatching of the eggs.

The number of hens to be mated to each male bird varies with the different breeds, and is also dependent on the conditions under which they are kept. The more freedom the birds have the greater is the number of hens that can be mated to each male. With White Leghorns, 12 to 14 hens can be mated to one male ; with Australorps and Rhode Island Reds from 8 to 10.

### *The Selection of Eggs for Hatching*

Eggs for hatching should be selected from those gathered each day. The hatching of many crippled, deformed, and " dead in shell " chicks could be prevented if normal-sized, strong-shelled, and well-shaped eggs only were set. The ideal hatching egg should weigh not less than 2 oz. and not more than 2½ oz., and have a smooth shell free from ridges or roughnesses. Thin-shelled eggs dry out rapidly, and also are more likely to get broken in the incubator. Those of normal egg shape are desirable. Therefore, if only good quality eggs are incubated, the resulting pullets are more likely to produce eggs of similar quality.

Eggs from breeding stock should be gathered frequently, especially in bad weather. Frequent gathering will obviate the need for cleaning the eggs which takes time, and may effect incubation. Dirty eggs should be cleaned before being placed in the machine, but they are best taken clean from the nest.

Eggs held for incubation should be stored in a cool well-ventilated room. Scientists tell us that incubation commences or that some changes take place in an egg at a temperature as low as 68° Fahrenheit. It is probable that eggs are not injured for hatching purposes if they are stored where the temperature does not go below 40° Fahrenheit. A temperature of between 55° and 65° should be ideal. The length of time that eggs can be held and still hatch reasonably well is debatable, but there is no doubt that the fresher they are the better. It is advisable to use eggs not more than seven days old.

### *Early Hatching Recommended*

Years of experience on commercial farms have shown that many advantages are to be gained by hatching early. Surplus cockerels may be sold on a higher market. Pullets develop well in the spring, and are better able to withstand extreme heat in the summer : they also mature quickly and begin to lay when egg prices are improving. Late-hatched pullets are hard to rear, they are slow in maturing and do not begin to lay until late in the winter, when egg prices are declining. While some early hatched pullets have a tendency to go into a false moult in the early winter, they more than make up for the short time lost by the increased number of eggs they lay in late summer and autumn. The months most suitable for hatching are July, August, and September.

### *Operating the Incubator*

Before the hatching season commences examine the incubator and replace any missing or broken parts, and before each hatch, thoroughly scrub and disinfect the machine with a good strong disinfectant such as formalin or hypochloride of soda. Some of the worst diseases affecting chickens can be spread by the agency of the incubator, hence the importance of this measure.

See that the heater is free from soot or dust; thoroughly clean the lamp and boil the burner in soapsuds to remove any oil or carbon. Fit a new wick at the beginning of the season, of such quality that it will not require replacement during the season. Trim the wick regularly each day, so that an even flame is produced ; a smoky flame will cause soot to form and soot may cause fire. It is a good practice to fill the lamp and clean the wick in the morning *after* handling the eggs. Handling the eggs with oily hands may result in a poor hatch. Never completely fill the lamp with kerosene ; a quarter-inch space should be allowed in the top of the bowl so that the kerosene will not run out after it warms and expands. The chimney should fit firmly on to the burner. The operator should be on the look out for cracks or breaks in the mica of the chimney, as these are often the cause of a smoky lamp. Then assemble the machine on a level base, and give it a trial run to see that all the parts are in working order. The instructions supplied by the maker of the machine

A tray of chicks just out of the incubator.

should be studied and followed carefully. Conditions, however, vary in different districts and in different incubator rooms, therefore regulations cannot always be rigidly observed, and must be varied to meet circumstances.

Have the machine well regulated and running nicely for a few days before the eggs are inserted, but it should be borne in mind that it is more difficult to keep an even temperature in an empty machine than in one filled with eggs. When cold eggs are put in the incubator the temperature will drop, and some time may elapse before it can be brought back to normal. When running at the desired temperature, the regulator damper should be hanging about one-eighth inch above the chimney ; it is then in the best position to operate against a rise or fall in temperature.

To operate an incubator successfully, keep in mind three essentials—temperature, fresh air, moisture. The best development of the chick embryo takes place when these are present in proper proportions.

### *Heat*

The experience of most operators is that the correct temperature for incubating hen eggs is from 103° to 104·5°. The temperature should always be read with the bulb of the thermometer just two inches above the tray on which the eggs are placed, that is just a little above the tops of the eggs. As the temperature varies at different levels in the egg chamber, it is important that the readings be made at a constant level. At the commencement of the season the thermometer should be tested by a chemist, or by comparing it with a clinical thermometer. If it is not registering correctly, allowance can be made accordingly. Good results are usually obtained when the machine is operated at 103° for the first week, 104° for the second week and 104° to 105° for the third week.

To maintain an even temperature the machine should be operated in a room which is not greatly affected by outside temperatures. High temperatures are more dangerous to the embryo than low temperatures. Instances have been recorded of eggs accidentally becoming cold for several hours during the incubating period, and still giving a satisfactory hatch. It is advisable to note down the temperature of the machine at regular intervals. This record is a valuable guide in future operations.

### *Fresh Air or Ventilation*

The chick embryo needs oxygen which it obtains from fresh air, and to ensure a regular supply of fresh air in the machine, the incubator room, as well as the machine itself, must be well ventilated. Many instances have been brought under the writer's notice where bad ventilation has been the direct cause of poor hatches—the chicks dying in the shell. Often, in the endeavour to keep the incubator room at an even temperature an operator will close the ventilators, but probably the lack of fresh air does more harm than a slight variation in temperature. Incubators are constructed on many different systems such as hot air, hot-water tank, or hot-water pipes, but in all of these a circulation of air through the machine is necessary. If the exchange of air is too rapid, the eggs will dry out, and this tendency must be corrected by supplying moisture.

### *Moisture*

It is difficult to determine the exact amount of moisture required ; mechanical devices are seldom reliable. It is advisable to do a little experimenting until one finds the amount of moisture needed to give the best results under local conditions. For beginners it is suggested that moisture be supplied during the whole of the hatch. It is doubtful whether too much can be supplied if the ventilation is correct whereas insufficient moisture is detrimental. The usual method of applying moisture is to place a tray of clean water in the machine, but probably with certain types of machine better results are obtained by keeping the floor of the incubator room damp. As evaporation takes place the moisture-laden air passes into the machine.

### *Turning the Eggs*

The machine should not be opened for the first two days, but from the third to the eighteenth day it is necessary to turn the eggs regularly to prevent the chick embryo from sticking to the shell, and to enable it to grow evenly. Where automatic turning devices are installed, and the turning can be done without affecting the temperature, the eggs should be turned five or six times a day, but where the turning is done by hand, it is not advisable to turn more than two or three times daily. A good method of turning is to take two or three rows of eggs off one side of the tray and roll the others over gently with the palms of the hands into the vacant places, then put the eggs, which were removed, into the places of those which were turned over with the hands. This ensures an effective turning, and also alters the position of the eggs on the tray. It is also advisable to reverse the tray each time it is replaced in the machine.

### *Testing*

The testing for fertility is done by holding the eggs in front of a strong light in a darkened room. The first test should be made on the fifth or sixth day, when the small embryo may be detected. Any clear eggs (infertile), or those with blood spots or blood rings, should be discarded.

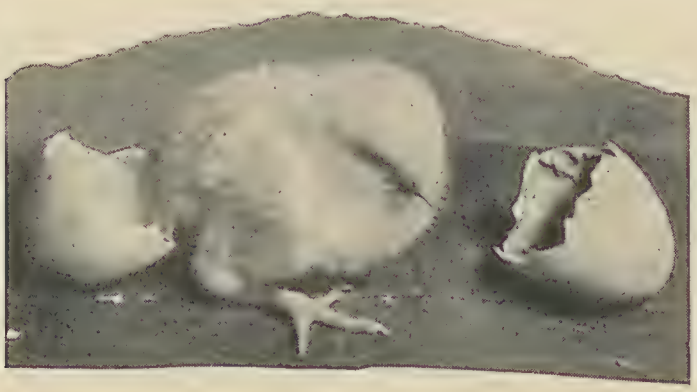
The second test should be made between the sixteenth and eighteenth days when the bulk of the egg should appear quite dark, and the air space fairly large and clearly defined. Any eggs containing dead embryos should be discarded. Removal of these eggs improves the conditions for the remaining eggs and allows more room at hatching time.

### *Cooling*

The question of cooling is a much debated one, and some poultrymen claim to get good results without cooling. The usual practice and the one recommended is to cool once a day from the third to the eighteenth day, the time of cooling ranging from about five minutes to twenty minutes. Cooling causes the contents of the egg to contract slightly, and fresh air is drawn in through the pores of the shell to the growing chick.

The eggs should be turned and cooled for the last time on the evening of the eighteenth day. At this stage it is most important that the eggs are placed flat on the tray, or with the large ends slightly upwards. If the small or pointed end of the egg is pointing upwards the chicken will probably start to chip at this end, and be unable to hatch normally.

The machine should not be opened until the hatch is practically complete, and the chickens should not be taken from the incubator until they are properly dried off. They may then be placed into chick boxes—the best type used for transporting chicks by rail—for a few hours, or they may be transferred direct to the heated brooders.



# THE FLOWER GARDEN

By J. L. Provan, B.Agr.Sc., Principal, School of Horticulture, Burnley Gardens

### *Cutting the Lawn*

TO make a first-class job of cutting a lawn, the mowing machine must be in good order. The blades on the cutting cylinder must be sharp, and adjusted to the stationary blade, and the roller must be properly set. Before use, the machine should be carefully oiled with a light type of machine oil.

Inspect the lawn carefully and remove any sticks, small stones or other foreign matter which may be caught in the blades of the machine. Failure to do this may result in the blades becoming chipped or burred.

For the first mowing of the season the lawn should not be cut too closely, but only lightly trimmed. During the successive cuttings the mowing can be done a little closer, until towards the summer the minimum length of grass is allowed to remain. The number of times the lawn should be mowed will depend upon the type of grass and the rate at which it grows. Usually in the early part of the season, and again later in the season, one mowing every week or ten days may be sufficient, but when the grass is growing rapidly at least one mowing a week will be necessary. In the early part of the season, if the grass grows very long before cutting, yellow patches and discoloured areas will appear in the lawn after it is cut. These discoloured areas are caused by the lower blades of grass getting insufficient light, and under these conditions their normal green colour turns to yellow. The same effect occurs when any object is allowed to remain on the lawn undisturbed for a few days. If possible, avoid cutting the grass when it is wet, either from dew, rain or sprinkling.

The actual method of cutting the lawn will depend upon what effect is required. By going round and round the lawn with a lawn mower, one half will appear a lighter green than the other half. Some gardeners prefer to have alternate dark green and light green strips across the lawn, and to obtain this effect, mowing commences at one end of the lawn and proceeds backwards and forwards across the lawn. Never cut in the same direction in successive mowings. One week mow across the lawn, and at the next mowing cut from end to end. At the next mowing the cut should be made diagonally in one direction, at right angles to this direction in the subsequent mowing. When mowing be sure that the rotating cylinder slightly overlaps the cut part by about 1 inch. To do this you must keep your eye on the cutting cylinder rather than on the wheel of the lawn mower.

The alternate dark green and light green strips are obtained by mowing backwards and forwards across the lawn.

Except when the grass is very long, it is advisable to allow all the clippings to remain on the lawn. They finally rot down and form valuable humus and assist in maintaining soil fertility. If the clippings are continuously removed then it is necessary to be more liberal in the application of manures and fertilisers in order to maintain a desirable green colour.

After mowing, always clean your machine either with a small brush, or if the grass is clinging, turn the machine upside down and hose it. It should then be dried and the metal parts rubbed over with an oily rag.

### *Aphis and Mildew*

A sharp lookout must be kept for aphis at this time of the year. As soon as this insect pest is noticed on plants, spray with nicotine

sulphate at the rate of 1 tablespoonful to 2 gallons of water, adding about 1 oz. of soft soap to the water. This soft soap will improve the wetting properties of the spray and increase its effectiveness. If nicotine sulphate is unobtainable, use summer white oil emulsion, at the rate of ¼-pint to 2 gallons of water. Be sure to spray the underside of the leaves and pay particular attention to any curly leaves which may shelter aphis.

For control of mildew, dust with sulphur or spray with wettable sulphur as soon as the first signs of this fungous disease appear on the surface of the foliage.

## THE VEGETABLE GARDEN

### Beans

The first sowing of dwarf French beans can be made this month. This crop requires a rich soil and at this time of the year, a sunny position. Raised beds will be found to be warmer than flat ones. In preparing the beds for this crop, dig in well decayed organic matter or manure and apply about 2 oz. to the square yard of superphosphate. Space the rows about 2 ft. apart and allow 4 to 5 inches between the seeds. The seeds should be planted at a depth of from 1 to 2 inches. Soak the seed in water for a few days before planting in order to reduce the time which it would normally take to come through the soil. At this time of the year quick germination is beneficial.

Suitable varieties to plant now are *Brown Beauty, Negro Longpod, Emperor William* and *Wellington Wonder.* It is very important that a good strain of selected seed should be obtained. The seed should be disease free and discard any shrivelled or discoloured seeds.

### Cabbage

This month seed of *Early Jersey Wakefield* and *Henderson's Succession* cabbages may be sown in seed beds or seed boxes. Cover the seed with about ¼-inch of sandy soil.

Young plants of these varieties can also be transplanted into the garden beds at the end of this month. Space the plants about 2 ft. 6 inches apart each way. A "staggered" system of planting should be adopted, with the plants in one row opposite the middle of the space between the plants of the previous row.

A careful watch must be maintained for the first signs of any damage due to the cabbage white butterfly and the cabbage moth. The larvae of both these insects attack young seedlings in the seed beds as well as the young plants which have just been transplanted. If small holes appear, dust with arsenate of lead dust. As the season advances, it will be necessary to repeat these dustings at intervals of about ten days, in order to protect the new leaves which develop. It is very important to reduce the attack of these insect pests early in the season, otherwise it will be found very difficult to keep the hearts free later.

### Tomatoes

Prepare the soil for tomatoes by digging in generous amounts of well-decayed organic matter or manure, with bone dust or superphosphate at the rate of 2 to 3 oz. to the square yard. In sandy soils an application of 1 oz. to the square yard of sulphate of potash will be useful.

Although many gardeners commence planting tomatoes early this month, the general experience is that a far greater porportion of these plants succumb to virus and other diseases. Better results can be obtained by delaying the planting until early in November.

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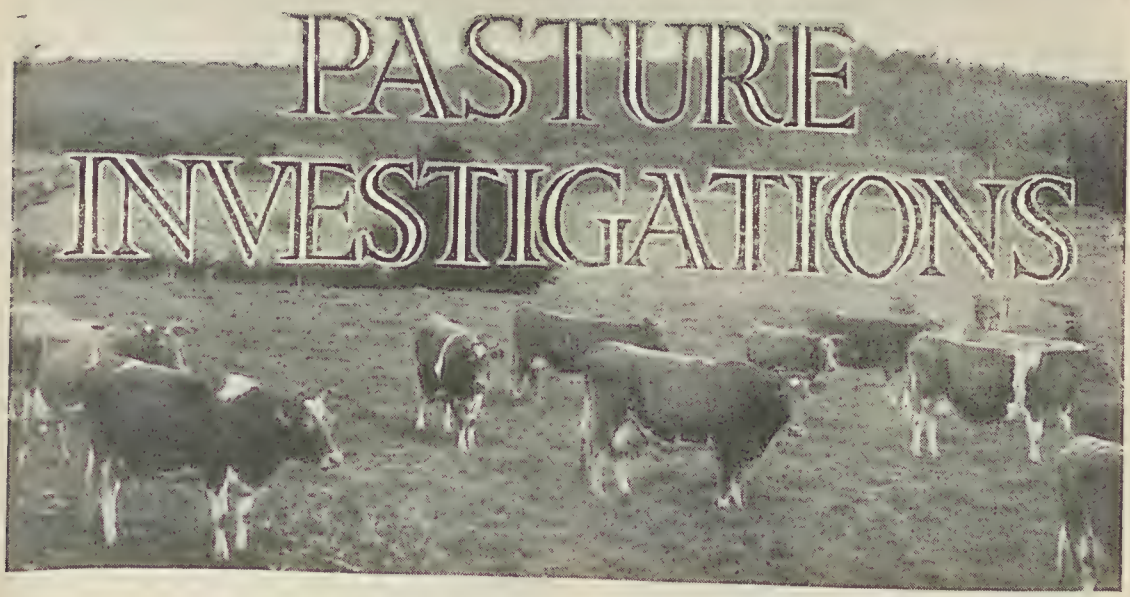
# PASTURE INVESTIGATIONS



*Extracts from the 1944-45 Annual Report of the Department of Agriculture to the Victorian Pasture Improvement League*

By W. D. ANDREW, M.Agr.Sc., Agrostological Research Officer

AT the present time the need for grassland products such as butter and meat, is an urgent one, and the development and maintenance of vigorous healthy pasturage are of more importance than ever before. Not only do good pastures ensure an adequate food supply, but they make for agricultural and financial stability in the community.

At no time in the history of Victoria has there been a greater need for accurate guidance in all matters relating to pastures, as maximum production is being sought despite limitations of manpower and fertilizers, and inefficiency and wastage of effort must be reduced to a minimum if food objectives are to be attained.

Owing to the diversions of staff to other duties, practically all quantitative work on pastures was suspended at the end of 1941, but it is hoped that as conditions become more normal this class of work may again be carried out, probably along lines different from the earlier trials.

In the meantime, two trained technical officers are maintaining observational trials embracing species and fertilizers at 45 centres, in conjunction with other duties. Such work provides valuable guidance to problems that could be tackled on a more intensive scale when conditions permit, and plans for such work are in the course of preparation.

One phase of pasture improvement work that is receiving more attention than formerly is the development of pastures on poor land. This embraces trials with the so called "minor elements" such as copper, zinc, manganese, molybdenum, &c., and experiments to determine the most suitable introduced species and the best means of establishing them. Because of the poor fertility of some of this country it is often necessary to commence the building up of good pasturage by the introduction of low-grade pioneer species, which after a few years can be replaced by better ones. Trials involving such a procedure must necessarily be planned on a long-term basis.

## *General Principles of Pasture Improvement*

### Selection of species and strains.

In selecting superior plants for the improvement of pastures it should be appreciated that the more productive types of plant make greater demands

Subterranean Clover. Left.—Dwalganup (early) variety. Centre.—Mt. Barker (midseason) variety. Right.—Tallarook (late) variety.

upon soil fertility than the poorer types; and the provision of adequate plant food is essential if full advantage is to be gained from the introduction of better species.

On virgin soils of high fertility sown pastures will sometimes persist for a number of years without artificial fertilizer, but usually if the sown pasture is not top dressed regularly, the introduced species disappear, and are replaced by weeds and native plants of a lower order. For this reason, it is unwise to attempt any pasture improvement unless supplies of artificial fertilizer are assured.

A good pasture should consist of an admixture of vigorous clover and grass plants, the clover being the more important of the two, but both being complementary to each other. Clovers and other leguminous plants fix nitrogen from the air whereas grass plants cannot do this, and consequently are dependent upon other agencies for their supplies of nitrogen. This element is essential for growth and development of plant tissue. Grass without clover or nitrogenous fertilizer cannot fully express itself because of an insufficiency of nitrogen in the soil, whereas clover growing alone tends to build up soil nitrogen to such an extent that high-fertility weeds develop and become a nuisance. Apart from this aspect, however, a diet of clover only is not the best for stock and the addition of grass gives a better balance to the fodder.

## Clovers.

Generally throughout the State where the rainfall exceeds 18 to 20 in. per annum, *subterranean clover* is a basic element in all improved pastures, although where the summer rainfall is good or irrigation is available, it becomes subordinate to white or red clover. Under swampy conditions strawberry clover and birdsfoot trefoil usually dominate the pasture.

Various strains of pasture species occur, and in sowing seed it is desirable to choose the strain most suited to the environment. With subterranean clover, the varieties may be broadly classified according to their time of flowering, into "early" "mid-season" and "late".

The early varieties are suitable for districts where the growing season is short because they can flower and form seed before the dry conditions set in. A common early variety which is available in commerce is one known as "Dwalganup".

For southern districts in Victoria where the rainfall is 25 inches or more, a mid-season variety such as "Mt. Barker" would be generally suitable and for the better rainfall areas, the later flowering and more leafy varieties such as "Tallarook" could be included with advantage. These later kinds, however, mostly suffer from the disadvantage of relatively poor winter growth.

A good variety for winter production is the one known as "Bacchus Marsh". As its time of flowering is a little earlier than "Mt. Barker" it is very suitable for districts marginal for the mid-season variety.

The various strains of *white clover* are not so easily defined as are those of subterranean clover, because owing to cross pollination, numerous types develop, that differ from one another to a slight degree.

Of the various strains available in commerce, "White Dutch" is the least suitable for permanent pasture on account of its relatively short life and poor vigour. Strains designated as "permanent pasture", "mother" or "pedigree" on the other hand possess the characters of vigour and persistence to a marked degree and are eminently suited for permanent pasture.

For irrigated conditions strains of giant white clover are available, the one most common in the trade being sold under the name "Irrigation White Clover".

For low lying moist country, *strawberry clover* is a valuable pasture legume, and one of its virtues is tolerance of moderate salinity. It is a perennial summer growing species that spreads readily by creeping and once established, remains as a permanent element in the pasture. Under irrigation, certain giant types have been recognized, but so far have not been commercialized in Victoria. A strain known as "Palestine" has attracted some attention in South Australia because of its vigorous winter and spring growth, and could be sown here with advantage under conditions suitable for strawberry clover. It cannot, however, compete with subterranean clover if conditions are favorable to the latter.

Strawberry clover will grow on heavy waterlogged soils unsuitable for "sub." clover and under such conditions, the *Birdsfoot trefoils* also become important. The commonest of these is the so-called "Lotus major" which grows well on heavy or light soils provided there is abundant moisture during the summer months. "Birdsfoot trefoil" is particularly useful as a pioneer legume on poor low-lying peaty or sandy country such as one finds in the coastal areas. Another species that shows promise for such conditions is "nodding" or "gin-gin" clover.

On the better drained soils, *perennial red clover* ("Cow Grass") and lucerne are useful summer growing leguminous species that can be used for grazing or cutting for hay as desired. While "cow grass" is only suited to places where sub-soil moisture is readily available during the summer months, lucerne is very drought resistant, but is particularly sensitive to poor drainage.

Lucerne is well suited to alkaline soils where subterranean clover does not thrive and other species that do well under such conditions are *barrel* and *burr medick*. To obtain best results from lucerne, cutting or grazing should be regulated so that the new shoots arising from the crown of the plant are not damaged. This ensures a vigorous recovery without a heavy drain on the reserves of plant food in the rootstock.

## Grasses.

Of the various grasses available for pasture improvement, the *rye grasses* are undoubtedly the best. Under the Government certification scheme, excellent regional strains of perennial rye grass are available from the Colac, Clunes, and Kyneton areas. For temporary pasturage, there are several short-lived types of rye grass that can be sown, the most common being "Wimmera", a true annual, "Italian" and "South Island New Zealand rye grasses" short-lived perennials. Both Wimmera and Italian are well adapted to growing on land that is very wet in winter but dry in summer.

White clover is an excellent pasture legume for the better rainfall districts.

*Cocksfoot* makes its best contribution as a pasture grass on deep loose soils where summer rainfall is good, such as in the Gippsland hill country. It is primarily a grass for cattle.

*Phalaris tuberosa* can be sown for sheep or cattle and is the most suitable permanent grass for places where perennial rye grass will not persist either, because of excessive wetness or summer drought. At the seeding stage, this grass is very sensitive to competition and consequently special precautions have to be observed when introducing it. While it is unsatisfactory to sow a mixture of perennial rye grass and "phalaris", a light seeding of "Wimmera" say ½ lb. per acre, should not have any serious competitive effect. Once "phalaris" is firmly established and conditions are good enough for perennial rye grass, this species could be established amongst the "phalaris" by surface cultivation and the pasture thereby improved.

"Phalaris" is a good perennial pasture grass for those districts which are too dry for perennial rye grass.

*Paspalum dilatatum* has in the past been relegated to a rather unimportant place as a pasture species because of its assertiveness and tendency to coarseness. If kept short and adequately fertilized, however, it can be a very useful summer-growing pasture plant, but it provides no feed during the frost period.

For swampy conditions a species known as *Paspalum distichum* can be introduced with advantage being usually propagated from cuttings, and where there is fresh moving water, "*Poa aquatica*", can be employed in the same manner. Both of these species combine well with lotus major, strawberry and white clover.

**Choice of Seed.**

Under the Victorian Seeds Act, all seed sold for sowing or planting must conform to certain standards of purity and germination. There is provision under the Act for the certification of superior strains of pasture species and those included at present are :—

1. *Victorian Perennial Rye Grass.* "Colac", "Clunes" and "Kyneton" strains.
2. *Victorian Phalaris tuberosa.*
3. *Subterranean clover.* "Tallarook" and "Bacchus Marsh" strains, the former a late and the latter an early midseason type.
4. *White Clover.* "Irrigation White Clover".

In introducing seeds, the emphasis should always be on quality and not on quantity, for heavy sowings will not compensate for the use of inferior strains. Attention to improvement of soil fertility is a vital part of the program of plant introduction. In general, more seed should be sown when broadcasting than when seeding with the drill or "combine".

Trials have shown that dense productive stands of pasture can be produced from the drilling in of as little as 5 lb./ac., of the grasses and 3 lb./ac., of the large seeded clovers. Species such as white clover and lotus major can be well established from seedings of ½ lb. per acre. The mortality among seedlings is apt to be very high so the custom is to sow considerably more than would appear necessary from the table on the next page.

**Methods of Establishment.**

It is important in sowing down, to introduce seed on to a firm moist and clean seed bed where there is an adequate supply of readily available plant food. To ensure that seedlings obtain food readily, it is desirable to sow seed and fertilizer mixed together.

While sowing with a drill or "combine" on well-prepared ground gives the introduced plants the best chance of becoming established, other methods that involve less soil preparation can be effective if carried out during favorable climatic conditions. One of the biggest drawbacks to sowing without thorough soil preparation, however, is the likelihood of the surface soil drying out during the critical period following germination, but there is the advantage that much larger areas can be covered than when the plough is used.

Competition from weeds is an important factor in determining the success or failure of newly-sown pastures for pasture seedlings are easily suppressed in the struggle for light, moisture and plant food.

Ploughing permits existing vegetation to be destroyed while the crop of weed seedlings that appear on the cultivated land can be eradicated by working the ground before sowing. By such means a clean seed bed can be prepared.

If, for various reasons, it is not desirable to plough, the top vegetation can be destroyed by burning and the scrub given a severe set-back by working the surface of the land with an implement such as a disc cultivator. With this method, one has to contend with a certain amount of regrowth, but this can usually be kept down by using cattle to trample and nip off the young shoots, and in addition by the use of the slasher or mower.

In bracken-fern country a specially constructed steel roller that bruises the stems of the fern instead of cutting them off is said to be more effective than mowing

To recoup the cost of cultivating land for introducing an improved pasture, a cereal crop is often sown. Should ploughing be undertaken, several crops may be harvested before the pasture is sown with the last crop, whereas with surface sowing, normal practice is to sow cereal crop and pasture the first year.

The number of crops taken off ploughed land before sowing down is often determined by the amount of scrub that has to be eliminated but care should be exercised that in the process, soil fertility is not unduly depleted through the removal of large quantities of crop produce.

Roller used by H. Anderson, Inverloch, for rolling down heavy scrub.

On soils of low fertility carrying dense scrub vegetation where several clearing crops are to be grown, they should be grazed off in preference to being harvested. Some of these soils are shallow and deep cultivation is inadvisable.

When setting out to "grass down" heavily-timbered land a common practice is to "ring-bark" the large trees, knock down the scrub and fire it, and then sow pasture seed and fertilizer on the ash-bed with or without surface working.

Subsequent development of the pasture will depend upon how effectively the regrowth of scrub is suppressed and whether or not the land is top-dressed with superphosphate and other fertilizers, as the case may be.

In open country, south of the dividing range on soils of medium texture, fertilizer, pasture seed and oats can be introduced in the one operation by using a "combine" fitted with medium sized points. The advantage of this method is that only some of the native grass is destroyed and the oats that are grown compensate for the expenditure. Should the season be a particularly favorable one the spring surplus may be cut for hay.

As the success of this method of plant introduction hinges on having the surface tilth moist during the first week or two, it is essential that the job be done rapidly as soon as weather conditions in the autumn are suitable. This means having everything in readiness for an immediate start once the ground becomes soft enough to take the "combine".

In districts where the surface soil dries out more rapidly, such as north of the Dividing Range, the method of surface-sowing is more speculative and a deeper working is advisable, particularly on second- and third-rate land. A method that is sometimes used is to first break the surface

| Seed. | Number of Seeds per Pound. | Minimum Germination Permissible. | Number of Germinable Seeds per Pound. | Germinable Seeds per Square Foot when Sown at the Rate of:— | | | |
|---|---|---|---|---|---|---|---|
| | | | | 1 lb. per Acre. | 5 lb. per Acre. | 10 lb. per Acre. | 20 lb. per Acre. |
| | | % | | | | | |
| Perennial Rye Grass .. .. | 240,000 | 65 | 156,000 | 3·58 | 17·90 | 35·80 | 71·60 |
| Wimmera Rye Grass .. .. | 225,000 | 65 | 146,000 | 3·35 | 16·75 | 33·50 | 67·00 |
| Cocksfoot .. .. .. | 500,000 | 60 | 300,000 | 6·89 | 34·45 | 68·90 | 137·80 |
| Phalaris .. .. .. | 350,000 | 55 | 192,500 | 4·42 | 22·10 | 44·20 | 88·40 |
| Paspalum .. .. .. | 370,000 | 20 | 74,000 | 1·70 | 8·40 | 17·00 | 34·00 |
| Meadow Foxtail .. .. | 460,000 | 35 | 161,000 | 3·69 | 18·45 | 36·90 | 73·80 |
| Subterranean Clover .. .. | 60,000 | 70 | 42,000 | 0·96 | 4·80 | 9·60 | 19·20 |
| White Clover .. .. .. | 670,000 | 70 | 469,000 | 10·77 | 53·85 | 107·70 | 215·40 |
| Red Clover .. .. .. | 240,000 | 75 | 180,000 | 4·13 | 20·65 | 41·30 | 82·60 |
| Lucerne .. .. .. | 240,000 | 75 | 180,000 | 4·13 | 20·65 | 41·30 | 82·60 |

Cape weed will not invade a closed sward of kikuyu and rye grass at Cudgee, but flourishes among subterranean clover.

with a disc cultivator and then sow seed and fertilizer with the "combine". Some farmers prefer to sow oats and pasture seed through separate implements to reduce the effect of plant competition.

Subterranean clover is sometimes introduced merely by broadcasting a mixture of seed and superphosphate without any soil preparation and although this method is employed where implements are not available, it is not generally recommended on account of the uncertain results.

Feeding out mature pasture hay to cattle in the autumn and winter is another means of introducing pasture species, and it can be useful on stony country where implements cannot be used.

In certain circumstances it is desirable to "inoculate" the seed of leguminous species with nitrogen-fixing bacteria before sowing, to ensure the development of root nodules. The appropriate rhizobial organisms are often absent on soils of low fertility so that, when sowing down poor country, it is a wise precaution to "inoculate" the seed. Inoculated seed is often quicker in establishment and this is of importance in perennials in enabling seedlings to survive the first summer. This may be of great significance in the case of lucerne.

Special care has to be taken when sowing inoculated seed to prevent it coming into immediate contact with superphosphate as this inhibits the action of the bacteria. In such circumstances one should sow seed and "super." separately or use basic super. which has little effect on the bacteria.

### Grazing Management.

Stock contribute to the development of pasture but special care must be exercised in the grazing during the first year, as many young plants may be pulled out and the ground "poaches" easily after cultivation.

Grazing encourages stooling of sown species and prevents undue losses from the smothering effect of weeds, while the addition of animal excreta to the soil is beneficial.

While the pasture is young, defoliation should be light and infrequent to allow seedlings periods for recuperation between grazings. In the early stages young cattle are better to use than sheep.

Towards the end of the first season stocking should be "lightened up" to permit the perennial species to build up strong root systems to fortify themselves against the dry period and to enable the annuals to seed themsleves down for the following year. The residue of unconsumed spring growth protects the soil against erosion and serves as a valuable cover for young seedlings the following autumn.

After the first year the rate of stocking can be increased but it is still important to allow the pasture periods for recuperation. The type of pasture that develops will be a reflection of the manner in which it is grazed and grass dominance will follow lenient stocking, whereas clover will become the main species if the pasture is subjected to continuous close grazing.

Regular top dressing is essential to the development of the pasture and occasional mowing for hay or silage is quite a sound practice but one should be careful not to mow too frequently as this has an exhaustive effect on soil fertility, reduces the vigour of the pasture plants and allows weeds to gain an entry. On poor soils one should be particularly vigilant in this matter of depletion of soil fertility.

Accumulations of dung should be regularly spread with the pasture harrows to prevent the development of rank unpalatable growth and bare patches.

[continued on page 490.

# A Fertilizer Trial on W.B.C. Pears in the Goulburn Valley

By G. W. GAYFORD, B.Agr.Sc., Special Horticultural Instructor

A fertilizer trial on a Williams' Bon Chretien pear block under irrigation at Shepparton, has been in progress since 1936. The block was made available for the trial by Mr. W. J. Mulconry, whose interest and co-operation in the work is gratefully acknowledged. This trial was one of a number established on apple and pear orchards throughout Victoria under a grant from the Commonwealth Government for research and instructional work in the apple and pear industries. Since this grant has become exhausted, funds provided by the Department of Agriculture have been used for the continuance of the work.

THE trial was set out with the object of determining the effect on yield and quality of fruit and on tree health of some artificial fertilizers commonly used by orchardists, namely sulphate of ammonia and "complete" fertilizer, 2:2:1 (i.e., 2 parts superphosphate, 2 parts sulphate of ammonia, 1 part sulphate of potash). Trees not receiving any fertilizer treatment were included in the trials. Rates of application 4 lb. per tree sulphate of ammonia and 5 lb. per tree, complete fertilizer), were such that the cost per tree was approximately the same, at the time of establishment representing about 2d. per tree. The fertilizers were broadcast by hand around each tree on the area covered by the spread of the branches.

The applications were made in August before bud burst and were immediately ploughed in. Guard trees between and outside the plots received half applications on the sides nearest plot trees.

Since 1943, nitrate of soda (16 per cent. nitrogen) has been used instead of sulphate of ammonia (20 per cent. nitrogen) which has been in short supply. The application per tree of nitrate of soda was fixed at 5 lb. per tree, so that the trees have received the same quantity of nitrogen. It has also been necessary since 1943 to substitute complete fertilizer, 4 : 4 : 1 (still containing sulphate of ammonia) for the 2 : 2 : 1 mixture because potash also has been in short supply. The rate of application of the 4 : 4 : 1 mixture

was continued at 5 lb. per tree so that the quantities of sulphate of ammonia and "super" have been slightly increased and the quantity of potash slightly reduced.

### *Layout of the Trial*

The trees were planted in 1921, and up to the time of establishment of the trial, had received various fertilizers which had been applied uniformly over the block. A randomized block layout was used for the trial. As a result of a uniformity test in 1936, six-tree units were selected for treatment plots. The three treatments, "nil" "nitrogen" and "complete" arranged in random positions in a group made up a block or replication, and this block was repeated seven times (Fig. 1).

The soil is described as Congupna clay loam by Skene and Freedman (1). It has a shallow, grey brown, heavy surface with a yellowish grey subsoil.

During the summer the plot was irrigated and cultivated on a normal schedule and a green manure crop of tick beans was grown during the winter when weather conditions permitted.

Yield records were obtained from each plot at each harvest by weighing the fruit in lug boxes as it was picked. At the same time, windfalls were collected and the weight of these included in the yield for each plot. The yield figures were analysed by Fisher's Analysis of Variance method. The Co-variance method was used each year except the last year of the trial to adjust yields for characteristic tree differences which were shown in the first year (1936–37).

### *Effect of Fertilizers on Yields*

In Table I., yield figures for each treatment are expressed as the average weight of fruit per tree gathered each year. These figures show that until four years after the trial was commenced no significant differences in yield between the

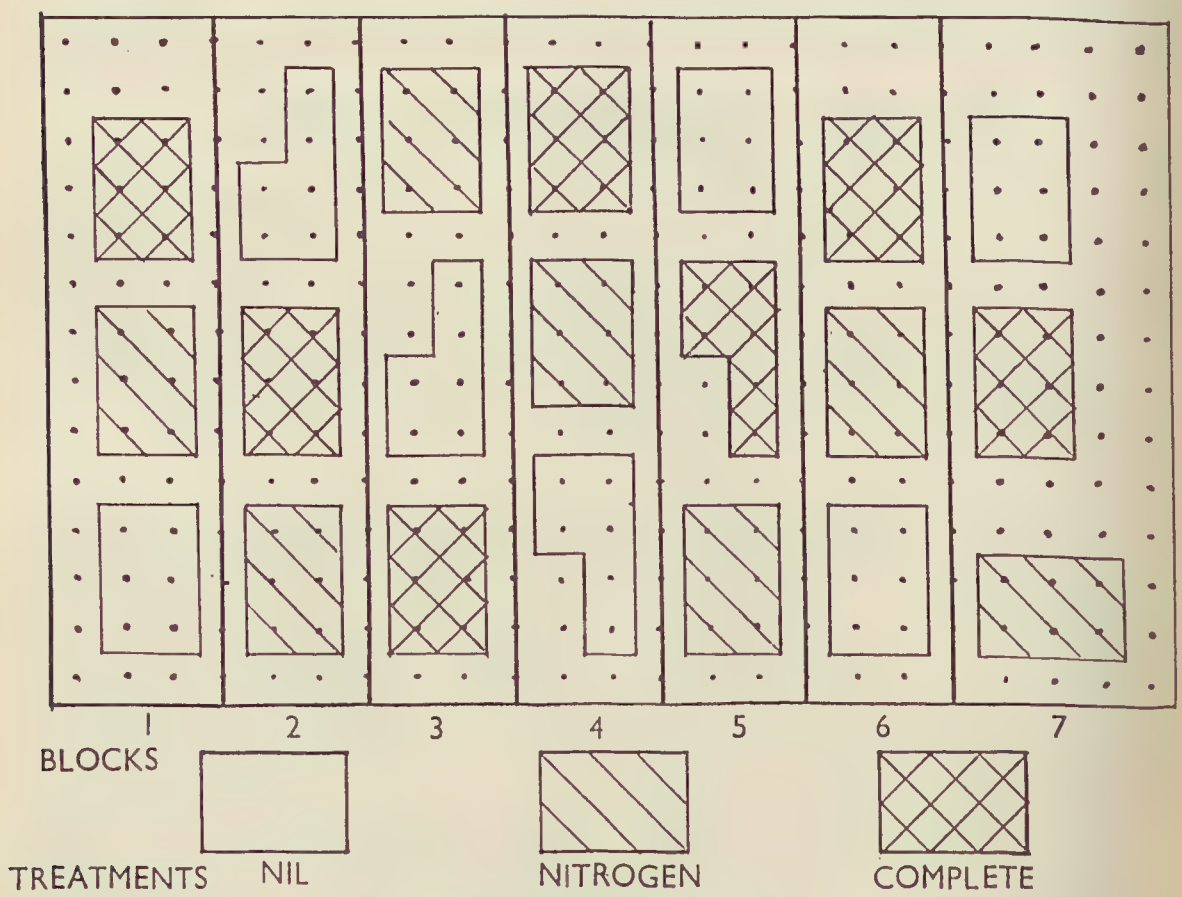



Fig. 1—Plan of the Experimental Block.

## TYPICAL TREES UNDER EACH TREATMENT

"Nil" plot.

"Complete" plot.

"Nitrogen" plot.

various treatments were recorded. This is of importance in view of the short supply of fertilizers during the war period. It can be seen from these figures that trees which received no fertilizer treatments for these years continued to produce satisfactory crops and four years passed before these trees dropped behind fertilized trees in productivity. The effect of withdrawal of fertilizers from trees may be noticed by poorer tree growth and colour of foliage in a shorter time.

TABLE I.

Average Wts. of fruit per single tree for each treatment.

| | Year. | Nil. | Nitrogen. | Complete. | Difference Necessary for Significance. | Increase Nitrogen over Nil. | Increase Complete over Nil. |
|---|---|---|---|---|---|---|---|
| | | lb. | lb. | lb. | lb. | lb. | lb. |
| Adjusted Means | 36–37 | 188 | 185 | 179 | 26 | | |
| | 37–38 | 196 | 217 | 201 | 42 | 21 | 5 |
| | 38–39 | 144 | 131 | 127 | 25 | | |
| | 39–40 | 181 | 262 | 228 | 37 | 81* | 47* |
| | 40–41 | 138 | 186 | 164 | 34 | 48* | 26 |
| | 41–42 | 120 | 206 | 176 | 49 | 86* | 55* |
| | 42–43 | No records | | | | | |
| | 43–44 | 177 | 227 | 214 | 32 | 50* | 37* |

* Increases over "nil" plots significant.

On similar experiments in other districts under different conditions of soil and climate, trees which have not received any fertilizers for eight years have not yet yielded significantly lower quantities of fruit than fertilized trees. This experience is a common one in fertilizer trials on fruit trees and indicates that application of fertilizers must necessarily be a long range project. It seems doubtful from the evidence obtained on these fertilizer trials whether there is any justification for the claims frequently made by some fruitgrowers that a single application of fertilizer has produced positive yield results in one year although it is possible that a heavy dressing of nitrogenous fertilizer would improve the appearance of a tree within a month or two.

An examination of the yield records on this plot shows that since significant differences were obtained, the average yield of trees on nitrogen plots has varied between 40 and 80 lb. higher than those receiving no fertilizer. These figures of course include a percentage of windfalls but as these are variable quantities not related to manurial practices, they do not alter the validity of the result (Table II.).

It is obvious therefore, that in return for an investment of approximately 6d. per tree for fertilizer, a handsome profit is made.

TABLE II.

The percentages of windfalls for each treatment in 1944.

| — | Nil. | Nitrogen. | Complete. |
|---|---|---|---|
| Percentage windfalls 1944 .. | 10 | 11 | 9 |

The increased yields over the "nil" plots obtained by the use of "complete" fertilizer varied between 37 and 55 lb. per tree and these increases were also profitable. Although in each year the "nitrogen" plots yielded more fruit than the "complete" plots, this increase was not sufficient to be significant.

TABLE III.

Average yields per tree for 1937–39 and 1940–44.

| Period. | Nil. | Nitrogen. | Complete. |
|---|---|---|---|
| 1937–39 .. .. | 176 | 178 | 169 |
| 1940–44 .. .. | 154 | 220 | 195 |

In Table III., a comparison is made between the average yields for each treatment during the period 1937–39, when no differences were recorded, and the period 1940–44, when differences were significant. This table shows that during the last four years of the trial, there has been a decline in productivity of the "nil" plots while both the "nitrogen" and "complete" plots have increased in productivity under the respective treatments. This would indicate that fertilizers containing nitrogen are necessary to maintain yields, and at the rates used in this trial, increased productivity was obtained.

TABLE IV.

Average Wt. of pruning per six-tree plot (1944).

| Nil. | Nitrogen. | Complete. |
|---|---|---|
| lb. | lb. | lb. |
| 75 | 130 | 105 |

### *Effect of Fertilizer Treatment on Growth of Trees*

It was not possible to secure regular records of the effect of the various treatments on growth of the trees. During the last two years of the trial it had become apparent that there was a considerable difference in the amount of yearling growth made by trees receiving the different treatments. In the winter of 1944, the prunings from all plots were gathered up and weighed. The lateral growth on the "nil" plots was short and displayed a reddish tinge while the growth of the nitrogen trees was longer and of a dark olive green colour. Prunings from the "complete" were intermediate in length. The weights of prunings from each plot were examined by the Analysis of Variance method.

The differences in weight between the "nil" and "nitrogen" plots, and the "nil" and "complete" plots proved to be significant. The average weights of prunings for each six-tree plot are given in Table IV.

Prunings obtained from typical plots under each treatment. Top.—"nil" plot. Left.—"complete" plot. Right.—"nitrogen" plot.

### *Chemical Composition of Prunings*

A few yearling laterals were selected at random from the prunings from each treatment and submitted to the Agricultural Research Chemist for analysis of the mineral content. The results are shown in Table V. These figures should be considered in conjunction with the weights of prunings. The crude ash content for the various treatments is in inverse proportion to the pruning weights so that the total amount of minerals absorbed under each treatment would be approximately the same. The quantities of potash and phosphoric acid are greatest in prunings from the "complete" plot, while nitrogen is higher in the plots receiving nitrogenous fertilizer.

TABLE V.

Mineral Content expressed as percentage of dried twigs.

| Mineral. | Nil. | Nitrogen. | Complete. |
|---|---|---|---|
| Nitrogen .. .. | ·87 | ·92 | ·83 |
| Crude Ash .. .. | 4·82 | 4·13 | 4·43 |
| Silica-free ash .. .. | 4·65 | 3·96 | 4·35 |
| Phosphoric Acid ($P_2O_5$) .. | ·32 | ·28 | ·33 |
| Lime (CaO) .. .. | 1·65 | 1·43 | 1·52 |
| Potash ($K_2O$) .. .. | ·64 | ·60 | ·74 |

In comparison with the quantity of minerals absorbed, the trees on the nitrogen plots have made more growth. This may be due to the larger number and more efficient leaves which have resulted from the application of nitrogenous fertilizers.

### *Effect of Fertilizer Treatment on Maturity of the Fruit*

The first pick of fruit from the block was always made to size (2½ inches diameter and over) for cannery requirements and it was considered that the proportion of this pick in comparison with the total pick for each treatment would give an indication of the effect of the treatment on earliness of maturity of fruit. In Table VI., the first pick is expressed as a percentage of the total for each treatment in each year during which significant differences in yield were obtained. It can be seen that the proportion of fruit in the first pick was always lower for the nitrogen plots while that from the "complete" and "nil" plots were approximately the same.

### *Discussion*

The main fact which arises from this experiment is that, if healthy annual growth and productivity are to be maintained, Williams' pear trees under irrigation require continuous applications of nitrogenous fertilizer. The rates of application in this trial, i.e., 5 lb. per tree nitrate of soda and 5 lb. per tree "complete" fertilizer, were sufficient for this purpose. Although the application of complete fertilizer did not result in such profitable increases in yield as the nitrogenous fertilizers alone, the differences in yield between these two treatments were not sufficient to be significant.

TABLE VI.

First pick expressed as a percentage of total pick.

| Year. | Nil. | Nitrogen. | Complete. |
|---|---|---|---|
| | % | % | % |
| 39–40 .. .. .. | 47 | 27 | 33 |
| 40–41 .. .. .. | 48 | 41 | 51 |
| 41–42 .. .. .. | 41 | 37 | 38 |
| 43–44 .. .. .. | 45 | 37 | 46 |

Apart from the fact that the increase in yield obtained by the "complete" fertilizer appears to be greater than would be expected from the nitrogen content alone, the trial does not show definitely that nitrogen alone is to be preferred to complete fertilizer at the rates used in this trial. The application of nitrogenous fertilizers alone, appeared to slightly delay the maturity of the fruit.

The time which elapsed between the start of the trial and obtaining the first significant differences in yield shows that immediate decline in productivity of fruit trees as a result of the discontinuance of fertilizers, is not to be expected.

### *Future Programme*

In order to bring back to full production the trees which have received insufficient nitrogen applications during the course of this trial, changes have been made in the treatments. The original "nil" plots now receive 10 lb. per tree, nitrate of soda in two separate applications of 5 lb. per tree; the original "nitrogen" plots continue to receive 5 lb nitrate of soda per tree and the original "complete" plots now receive 10 lb. per tree of complete (4 : 4 : 1) fertilizer. In time, it will be possible to determine whether the dressing of 5 lb. per tree of nitrogen fertilizer per tree, is maintaining the trees at their best productivity or whether more nitrogen can be applied profitably. It should also be possible to determine any beneficial effect from the potash and phosphoric acid content of the mixed fertilizers.


References.

(1) Skene, J. K. M., and Freedman, J. R., "Soil Survey of Part of Shepparton Irrigation District, Victoria". Tech. Bull. No. 3. Soils Section, State Laboratories, Department of Agriculture, Victoria.)

# Live Stock Notes

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### *Value of Using Proven Sires*

THE New Zealand Dairy Board has for a number of years been attempting, with considerable success, to measure the breeding efficiency of bulls used in the dairying industry by comparing the production of the daughters of these bulls with their dams' production. The value of this procedure is undoubted because the conclusive test of the breeding efficiency of any bull is the extent to which he leaves high-producing daughters.

On genetical grounds also, the efficiency of a bull should be judged by the production of his daughters, rather than on his pedigree. No matter how well bred a bull may be, it is possible that he may not breed as well as expected. Thus, the only sound and progressive method of stock improvement is to base breeding problems on the use, as far as possible, of outstandingly-good proven sires. As such animals are limited in number and it is impossible for all dairy farmers to use proven sires, the sons of proven sires out of proven cows should be used.

By "proven cows" is meant those cows which are not only good producing animals, with a lifetime record of high production, but also cows which have left high producing progeny.

The Dairy Board has been conducting surveys for a number of years, and up to 30th November, 1944, it has surveyed not less than 1833 bulls. Rather less than four per cent. of these bulls had left daughters with a production of 400 lb. butterfat or over, calculated on a maturity basis. Only about 13 per cent. had left daughters with over 380 lb. butterfat, again on the same basis.

Bearing in mind that these surveys were made in herds whose productions were recorded by herd improvement associations, and that in all probability, the bulls used in those herds were rather better than those used in all herds in the Dominion, it is plain that there are few bulls—in spite of what may be considered their excellent breeding—capable of materially raising the production of our dairy herds. The New Zealand Dairy Board recently published a register of all bulls which had been surveyed, and in this list is incorporated the production of cows which have good lifetime records, as well as the production of younger cows which have produced in three successive lactations not less than 1200 lb. butterfat. The Dairy Board has indicated in this register the bulls which are considered to be specially good breeding animals, and which have been given the title of "merit sires."

Massey Agricultural College has always recognised the value of using proven animals, and as far as possbile, has attempted to prove bulls before using them extensively. In its Friesian herd the College has achieved considerable success, and still has at the head of that herd a bull now 11 years old, namely, "Tokaora Domino Asjes," which, of all Friesian bulls surveyed, has the best results with an average production of 432 lb. butterfat for 17 daughters, compared with 420 lb. butterfat for their 17 dams, all calculated on a maturity basis.

Within recent years, the College has also been using the proven Jersey sire, "Greencroft Chancellor," which was purchased in 1941 at six years of age after he had been used with considerable success in the herd of Mr. J. A. McClean of Kaiwaka, North Auckland, and in whose herd 33 daughters produced 384 lb. butterfat compared with 377 lb. butterfat for their dams. The first batch of this bull's heifers from cows in the College herd came into production in the 1944–45 season. The 14 of them milked in that year had an average production as two-year-olds of 320 lb. butterfat in 289 days. This yield is equivalent to a probable maturity production of 384 lb. butterfat.

Farmers should not turn aside good bulls on the score of age, provided it is known that they are leaving good stock and that their fertility is reasonably good.

The above item was contributed by the Massey Agricultural College, N.Z., and is in line with modern developments in Victoria.

### *Feeding for Milk Production*

Pasture is the most economical of all crops and its value is probably not appreciated to the same extent in Victoria as in countries where a cold winter climate is experienced and costs of production are greatly increased by the necessity to house and wholly hand feed stock during the winter. In this State, it is taken for granted that dairy cows will remain in the paddocks throughout the year, that for some months the whole of their nutritive requirements will be supplied by grazing only, and that at no time in normal years will they have to be wholly maintained with expensive purchased or stored home-grown fodder.

Experience has shown that best use cannot be made of pastures if cows are allowed continuous access to the whole grazing area throughout the growing season. The rotational system in which the herd is grazed successively in a number of paddocks has not been adopted on many dairying properties, especially those which can be irrigated. Rotational grazing allows pasture in the unoccupied paddocks an opportunity to grow unchecked, and an increase in milk yield is always noted at each change to fresh pasture.

When pastures are luscious and abundant, the average dairy cow will maintain reasonably high production without any supplementary feeding at all, but for some high-producing cows it may be a physical impossibility to graze sufficient pasture to maintain their condition and yield to the full extent of their capacity. For example, a cow weighing 1,000 lb. and yielding 6 gallons of milk would need to graze about 200 lb. of pasture daily. Observations have shown that a cow in the 8 hours normally devoted to grazing will consume about 150 lb. of pasture when the sward is dense and 4 to 5 inches in height and this amount is reduced as the length of the pasture decreases. Therefore, for maximum production it usually pays to feed high-producing cows a small amount of crushed grain, pollard or some other carbohydrate-rich concentrate.

Luscious spring pastures are rich in protein, and the requirements of even the highest-producing cows will be met by the amount contained in the fodder grazed. It is, therefore, unnecessary to offer them a protein-rich concentrate such as meat meal or linseed meal.

Cows enjoy variety, and a portion of chaff in the bails or some hay in the paddock is appreciated by them. Although the effects of this practice may not be apparent, the dry roughage will help to maintain normal bowel activity. The amount of dry feed should, however, not be sufficiently great to lessen the appetite of the cows for pasture.

Unfortunately, springtime conditions do not continue indefinitely, and on properties where there is no irrigation, the pastures begin to deteriorate and the milk yield declines as the summer progresses. As soon as this is noticed, supplementary feeding should be commenced.

Cows vary in their inherited capacity to produce milk, but the greater yield of the high-producing cow is not due, as is sometimes thought, to its ability to produce more milk from the same amount of food than a poor one. The stimulus to secrete an abundance of milk results in a keen appetite in the good cow, and when the feed is available she will eat more than the low producer. Therefore, if not fed liberally, her yield will decline to the level permitted by the nutrients received. On the other hand, the low producer cannot increase her milk production beyond her inherited capacity and excess nutrients are stored in the form of fat. For this reason, it is a good policy to feed cows according to their production. If all the cows in a herd are fed alike, the good ones will probably be under-fed and the poor ones over-fed. Profitable production comes neither from cows which are half starved nor from those that are over-fed, but from those that receive a sufficient quantity of the right kind of food.

The maintenance of milk yield by feeding roughages and concentrates in addition to pasture is profitable up to a certain point and the amounts of supplements should be fed and the point at which further supplementary feeding becomes uneconomical can only be determined by constant observation and calculation.

The Victorian dairying industry is entering a period which will be marked by a considerable decrease in the number of dairy cows. The only immediate counter to the resultant drop in production will be better feeding to increase the average production of all the cows in the State. If the seasons are favourable and concentrates become more plentiful, there is no reason why this could not be done to the extent of raising production by 30 or 40 pounds of butterfat per cow. Even if the return to the farmer from the additional dairy produce were almost equalled by

The "creep" illustrated has a trough on each side, one for separated milk and one for meal. It is built on skids to enable it to be moved to fresh ground as required.

the cost of purchased feeds and the extra labour needed to bring about the increase, the critical world food situation should warrant the effort.

In addition to adequate feeding, it is essential that a satisfactory water supply should be provided for dairy cows, and as the quantity required varies, it is advisable to give them free access to an unlimited supply of clean water.

Variation in requirements is due to differences in size of the animals, prevailing temperatures, dryness of feed and level of production. Where luscious pastures are being grazed, less drinking water is needed, because such pastures contain about 80 per cent. of water. This means that a cow which has consumed 100 lb. of this type of pasture has also taken in 8 gallons of water.

Milk contains about 87 per cent. of water, so that in the milk of a cow yielding 6 gallons daily there are 5 gallons of water. It is, therefore, not surprising to learn that including both the water in their feed and the water they drink, cows consume between 4 and 5 lb. of water for each pound of milk they yield. Thus, a cow giving 4 gallons of milk will require 16 or more gallons of water daily, and the requirements of particularly high producers will exceed 30 gallons.

Milking cows will drink up to ten times a day, and the total amount taken will be more than in the case of cows allowed to drink only two or three times a day. Normally, cows do not drink in excess of their requirements, and as thirst is the best guide, they should, as mentioned earlier, have free access to an unlimited supply of clean fresh water.

[J. T. Kelly, B.Agr.Sc., Science Field Officer.]

### *Creeps for Supplementary Feeding of Sucking Pigs*

Most successful pig raisers have proved the value of supplementary feeding of pigs while they are sucking their mothers. Such feeding results in heavier pigs at weaning and that weight advantage is retained throughout the pigs' growth to bacon weight.

Supplementary feeding of suckers is usually commenced when they are three weeks old and continued until they are weaned at about eight weeks old. It is usually accomplished by providing a "creep" which provides access to the suckers, but not to the sow. Within the creep are two shallow troughs, one containing meal and the other water *or* separated milk.

The object is to have food and drink available constantly as the suckers require food, little and often. Dry meal is preferred to wet mash because the latter ferments when it is kept continuously in the trough.

A constant supply of water or milk is necessary because the pigs' consumption of dry meal is limited by their ability to obtain a drink.

A creep may be provided for each litter in its pen or, where several litters are run together in one enclosure, a community creep may be provided and under these conditions, the creep feeding compensates for any "robbing" done by the stronger pigs which sometimes drink from more than one sow.

[L. A. Downey, H.D.A., Pig Expert.]

### *Sheep Notes*

Indications are that there will be a serious shortage of meat during 1946, and it is most unfortunate that seasonal conditions should have caused such a drastic reduction in the total number of sheep in the State just when increased supplies of meat were most needed for export to England. At 31st March, 1945, there were 2¾ million less sheep in Victoria than at the same date in 1944, but the most critical period of the drought did not occur until the winter of this

year. During this period, in addition to high mortality on properties, many thousands of breeding ewes were sold for slaughter. The full extent of the losses will, therefore, not be revealed until the Government Statist's census is published in 1946.

In early districts, breeding ewes are now being mated for the next fat lamb season and mating will continue until February. Mating is the first of the operations which will culminate with the sale of the lambs towards the end of 1946.

Frequently, the only work that mating entails is selecting the rams and turning them in to the paddocks with the ewes, but in view of the necessity of endeavouring to get the maximum number of lambs from the ewes mated, a small amount of extra attention is warranted and such practices as yarding the sheep during one or two nights a week and flushing may be worth while. By "flushing" is meant the provision for two or three weeks before mating of a plentiful supply of nutritious green feed so that the level of nutrition is raised.

It sometimes happens that there is a short spring and breeders are unable to top-off and sell all their lambs. The balance are shorn and carried over until the autumn when they are fattened and sold. It is the opinion of many fat-lamb raisers that sires of certain breeds produce lambs which, although excellent in a favourable year, are not well-suited for carrying over. As it is the later born lambs which are generally affected by a short spring, they use in the second half of the mating season rams of a breed such as the Border Leicester which are believed to sire lambs better suited for carrying over if the necessity arises.

[J. T. Kelly, B.Agr.Sc.,
Science Field Officer.]

### *Drinking Water for Poultry*

A constant supply of pure fresh water is a vital necessity to all forms of life. Animals deprived of water will die within a few days, whereas animals deprived of solid food, but having access to water, will live for weeks.

Water as a nutrient is of the utmost importance to the body. Besides being an important structural component, water is a necessary agent in practically all bodily processes.

Water contained in the food consumed does not cover more than a small fraction of the actual needs.

Consumption of water below actual needs is a serious matter. It will impair digestion and result inevitably in loss of flesh and condition and decreased egg production.

With increasing temperatures, the need for water is correspondingly increased because of the greater loss of water through the lungs. This evaporation through the lungs apparently, is a bird's only means of temperature regulation. Most of the common mammals possess a further mechanism for heat regulation in the sweat glands, which is probably the explanation of the fact that they are better able to withstand higher temperatures than birds.

During hot weather, poultry farmers find it necessary to spray the birds and litter with water in order to prevent high mortality through heat apoplexy, and, the drinking water is placed in an easily accessible position.

Fowls consume large quantities of water, and if this is supplied daily by hand, it entails considerable labour which may be dispensed with by the installation of an automatic watering system. The chief requirements are to provide a continuous supply of water as pure and clean as possible, and cool during the hot weather.

The watering system should be so arranged that the water will not become contaminated with the litter, droppings, &c., and that the birds will drink directly over the water vessel to prevent drips from the beaks and wattles from falling to the floor and making it wet. Make sure that the water is protected from the sun during hot weather, and probably the best position for its installation is inside the houses.

Risk is incurred if drinking vessels are not frequently and thoroughly cleaned, as disease may be transmitted quickly by contamination of the drinking water.

[H. F. Clinton, Poultry Expert.]

### *Bee-keeping*

November is a busy month for the apiarist south of the divide. Swarming and swarm control is the most essential work, and it is necessary to have prepared hives of worker comb or full sheets of foundation ready to receive the swarms.

A plentiful supply of water in tins, and a spray pump is necessary around the apiary. If swarms are sprayed when on the wing, they will settle quickly, and they can be prevented from clustering in inaccessible places, if the spray is directed there. [*Continued on page* 485.

# TURKEY REARING

By W. O. PEDERICK, Assistant Poultry Expert

An attractive flock of American Bronze gobblers.

THE rearing of turkeys for the table can be successfully carried out in the northern areas of Victoria with less trouble and expense than is generally supposed, and many farmers and their womenfolk have made it a profitable sideline. In the Goulburn Valley, for instance, large quantities of wheat, oats, and lucerne are grown, consequently there is a good food supply, and climatic conditions are particularly favorable for this branch of poultry farming. A combination of stubble and lucerne paddocks makes ideal range, and even saffron thistle seed provides good food for the growing poults during the autumn.

Essentials for success are sound, healthy breeding stock, careful feeding and management of the young birds, and marketing at the right time.

Pure American Bronze is the most popular breed of turkeys. The breeding stock should consist of about a dozen hens from 14 to 16 lb. in weight, mated with a gobbler not less than twelve months old, and weighing from 24 to 30 lb. Males of this weight are more satisfactory than heavier birds, as the latter do not fertilize so well, and frequently injure the hens. Remove the spurs of old males by cutting them off about half an inch from the leg with a fine-tooth saw. Sear the cut with a hot iron to prevent bleeding.

The gobbler should be of robust constitution, with wide shoulders, long in the breast, and short in the leg. If such a bird is mated with hens of the weight mentioned above, offspring of a size and quality to bring the best prices in the Melbourne market should be produced.

Turkeys do best under natural conditions and should not be allowed to mix with other poultry. Encourage them to roost in trees, as turkeys roosting in the open are more likely to breed strong healthy chicks.

Suitable nests may be placed in secluded spots, but the turkey hens should be allowed to choose their own nests. Where there is no danger from foxes, the less interference the better until the young chicks are hatched. If it is thought advisable to shift the hen, this should be done as soon as she goes broody. A coop with a run attached should be placed in a sheltered position on a patch of green grass or lucerne. A comfortable nest should be made in the coop with soft earth and straw or pine needles. The eggs should be put in the nest, and the hen placed on them at dusk, and closed in for a day or so, when she should be taken off the nest and given water and food consisting of either wheat, oats, maize or barley, and shell grit. After two or three days she may be let out, and can then usually be relied on to go back to the nest after having had a run and a feed.

The incubation period for turkey eggs is 28 days. About two days before the hatch is due, the hen should be gently lifted off and given a dusting with a good insect powder, and then allowed to feed. By the time she goes back to the nest she will have got rid of any vermin and the chicks will have a clean start. Turkeys should always be handled carefully.

After hatching move the coop a few feet every day to give the chicks a fresh run. On the fourth day, the front of the coop should be raised a few inches to allow the chicks to run in and out, but the hen should still be kept inside. When the chicks are about a fortnight old, both mother and chicks should be allowed free range, and when they are ten weeks old a trestle frame should be made about 2 feet from the ground on which they can learn to perch. The perches should be not less than 3 inches wide, and if placed near a tree the birds will soon learn to get on to the branches.

Foxes sometimes cause great havoc in turkey flocks, and where these vermin are present it is advisable to enclose the roosting place with a fox-proof fence.

### *Feeding*

The feeding of turkeys differs only slightly from the feeding of fowls. The turkey chicks may be fed as soon as they will eat, and the first feed should consist of a good chick mixture which can be given either as a wet or dry mash. The usual custom is to have a dry mash always available, and to feed a wet mash twice a day. If the turkey hen is fed on whole grain and not allowed to eat the chicks' feed, much valuable food will be saved.

At the end of three weeks the wet mash can be fed once a day. Finely chopped tender green food should always be added to the mash.

Skim milk may be used in mixing the mash, and also for drinking purposes. A little cracked grain should also be fed in the evenings, and at the end of six weeks whole wheat and oats, with cracked maize, if available, should be given.

When the birds are allowed out on free range, with plenty of grass seeds and insect life available, the mash may be eliminated, and only a grain feed given in the evening to encourage the birds to come back to the roosting quarters, and also to supply any additional food that may be required.

### *Marketing*

Three weeks before marketing, the birds should be fed on grain which has been soaked in milk for 16 to 24 hours. Many growers make the mistake of sending their birds in for sale before they are ready. It is well to remember that size counts less with the buyer than condition. A plump, well-conditioned bird of 20 lb. will always sell better than a large-framed, poor bird, even if it weighs a few pounds more. Turkeys should reach their highest market value when nine to ten months old.

The bird A has the shape of breast desired by the best buyers. Crooked-breasted birds, such as B, C, and D never bring the highest prices.

A proportion of turkeys sent to city markets have crooked breasts. Poultry auctioneers are often blamed by consignors for not getting better prices, but good prices cannot be obtained for crooked breasted birds which are not wanted for the best trade. Turkey breeders would do a great deal to improve matters if they bred only from birds which are sound in the breast, and by providing perches not less than 3 inches wide for the young turkeys.

In the accompanying illustration, the bird B was the sire of the birds C and D. These two gobblers inherited the crooked breast of their parent, and although the three of them were plump, well-conditioned birds the shape of the breasts reduced their value considerably. The bird A has the shape of breast desired by the best buyers.

### *Careless Crating*

Careless crating by overcrowding is another cause of loss to the breeder. To land turkeys in the market in the best condition, turkey crates—not fowl crates—should be used. Not more than eight gobblers should be put in one crate; if they are very large, seven is enough; and not more than ten hens.

The crates should have at least 6 inches of straw in the bottom. This will make them more comfortable and also lessens the risk of the birds becoming injured during transit.

# Tubercle-free Herds

ACCREDITED TUBERCLE-FREE HERDS.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

| Name. | Address. | Number in Herd. | Name. | Address. | Number in Herd. |
|---|---|---|---|---|---|
| Aboriginal Station .. | Lake Tyers .. .. | 86 | Longerenong Agricultural College | Dooen .. .. | 42 |
| Armstrong and Son .. | Wangaratta .. .. | 105 | Maloney, P. J. .. .. | Tongala .. .. | 66 |
| Ballarat Orphanage .. | Ballarat .. .. | 132 | Murray, M. G. .. .. | Lima .. .. | 26 |
| Banyule Stud Pty. Ltd. .. | Wangaratta .. .. | 55 | McNabb and Son, G. A. | Irrewillipe East .. | 159 |
| Beggs, A. R. .. .. | Beaufort .. .. | 88 | Nancarrow Bros. .. | Kerang .. .. | 18 |
| Black, I. S. Estate .. | Mount Noorat .. | 60 | Noonan, G. .. .. | Benalla .. .. | 35 |
| Carne, W. J. .. .. | Pakenham Upper .. | 27 | Noonan, Mrs. S. A. .. | Benalla .. .. | 51 |
| Clark, W. J. .. .. | Monomeith .. .. | 140 | Northcote Children's Farm | Bacchus Marsh .. | 48 |
| Cowan, G. L. S. .. | Bacchus Marsh .. | 59 | Onley, W. H. .. .. | "Glenholme," Caldermeade | 76 |
| Cribbes, T. .. .. | Wangaratta .. .. | 39 | Parker, Mrs. L. M. .. | Tallarook .. .. | 67 |
| Deering, J. T. .. .. | South Wangaratta .. | 86 | Payne, A. E. T. .. | "Yarra View," Lilydale | 67 |
| Dennis, Mrs. A. A. .. | Frankston .. .. | 23 | Payne, T. E. N. .. | "Woodburn," Kilmore .. | 44 |
| Dookie Agricultural College | Dookie .. .. | 92 | Poole, M. A., and D. .. | Caldermeade .. .. | 120 |
| Everist, F. R. .. | Tyabb .. .. | 20 | Poole, M. A., and D. .. | Yannathan .. .. | 104 |
| Foletta, G. G. and Son .. | Buxton .. .. | 120 | Potter, W. J. .. .. | Longwarry North .. | 130 |
| Geelong Grammar School | Corio .. .. | 78 | Powell, T. S. .. .. | "Carellen," Mansfield .. | 43 |
| Gorman, A. W. .. .. | "Cathcart," Alexandra .. | 57 | Richardson, Bros., Messrs. | "Faldinghurst," Upper Beaconsfield | 53 |
| Griffin, G. W. .. .. | Gladysdale .. .. | 50 | Roe, Thomas H. P. .. | Cobram .. .. | 27 |
| Griffiths, J. G. .. .. | Benalla .. .. | 151 | School of Horticulture .. | Burnley .. .. | 6 |
| Gross, Mrs. G. F. .. | Green Lake .. .. | 21 | State Experiment Farm .. | Rutherglen .. .. | 47 |
| Hamilton, A. .. .. | Flinders .. .. | 64 | State Research Farm .. | Werribee .. .. | 245 |
| Howlett Mrs. G., and Miss E. Samuel | Lang Lang .. .. | 55 | Stephens, Dr. F. .. | Vermont .. .. | 32 |
| Jakobi, L. W. .. .. | "Granada," Yannathan | 89 | Vagg, T. R. .. .. | Officedale .. .. | 40 |
| Johnson, F. G. .. .. | Horsham .. .. | 11 | Warnock, J. A. .. .. | Benalla .. .. | 76 |
| Kilmany Park Farm Home for Boys | Sale .. .. | 105 | Waterhouse and Son .. | Pakenham .. .. | 55 |
| Lady Talbot Milk Supply Co. | Cranbourne .. .. | 513 | Wells, W. G. .. .. | Caldermeade .. .. | 67 |
| Lawrence, P. H. .. | "Rainga," Tarrawarra .. | 83 | Woodyer, P. A. .. .. | Mornington .. .. | 19 |

In addition to the above-mentioned herds there are 867 commercial dairy herds containing 23,099 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 342 herds in which 11,816 head of cattle have passed one test, and may be considered, therefore to be in the process of becoming tubercle free herds.

# EXTERNAL PARASITES OF POULTRY

By R. T. M. PESCOTT, M.Agr.Sc., F.R.E.S., Former Entomologist of the Department of Agriculture, and H. F. CLINTON, F.R.M.S., F.B.S.A., Poultry Expert

There are many insects and closely related forms which attack poultry in Victoria. Most of these are to be found as external parasites on the domestic fowl, while several others are also present on the turkey, duck, or goose. As the domestic fowl constitutes the greater portion of the poultry industry of the State, it is proposed to discuss only those pests with which it is concerned.

THE main external parasites of poultry present in Victoria are :—

Red mite.—*Dermanyssus gallinae* L.

Lice—

Common hen louse—*Menopon gallinae* L.

Wing louse—*Lipeurus caponis* L.

Head louse—*Lipeurus heterographus* Nitzsch.

Body louse—*Eomenocanthus stramineus* Nitzsch.

Fluff lice—*Goniocotes gigas* Tasch., *Goniocotes gallinae* Retz., and *Goniodes dissimilis* Nitzsch.

Fowl tick—*Argas persicus* Oken.

Scaly-leg mite—*Cnemidocoptes mutans* Robin and Lanq.

Depluming mite—*Cnemidocoptes gallinae* Railliet.

In addition to the above, a short account is given of the stickfast flea—*Echidnophaga gallinacea* Westw. which, though not yet present in Victoria, is present in some of the other Australian States, and should be watched for carefully.

## *The Red Mite*

(*Dermanyssus gallinae* L.)

The red mite is the most serious external parasite of poultry in Victoria.

### Nature of Attack.

The red mite attacks adult poultry as severely as young chickens. The mites normally feed upon the birds at night, leaving them during the day to hide in the cracks and crevices of the perches, walls, or surrounding woodwork of the pens, or nest boxes. They have a habit of congregating in groups, and it is not uncommon to find swarms of them under the roosts. The results of the attacks by red mite may be fourfold :—

(*a*) They may cause a great reduction in egg production.

(*b*) By their constant feeding and irritation of the skin of the bird, they may cause sitting hens to leave their nests.

(*c*) In severe cases, they may cause great loss of flesh, unthriftiness and reduction of vitality.

(*d*) They may transmit poultry diseases from infected birds to healthy ones.

### Hosts.

The hosts of the red mite are the domestic fowl, duck, goose, and turkey.

### Description and Life History.

The red mite is a small, pear-shaped, blood-sucking mite (Fig. 1.) measuring about one thirtieth of an inch long and one forty-fifth of an inch wide. The adult female lays her small, shiny white, oval eggs in the hiding places among cast skins, dust, and other debris. In from two to six days they hatch into tiny, active, six-legged mites. These feed for a short time, and cast their skins, emerging this time with eight legs. Finally, after several moults, they reach maturity. These mites are capable of living some time without food.

Fig. 1.—The red mite of poultry.

### Control.

The control measures for this pest are directed chiefly at the hiding places. These should be either sprayed or painted with one of the

recognized insecticides such as crude oil, a mixture of crude oil and kerosene, nicotine sulphate, or nicotine preparations, tar oil, or sheep dip. If a spray is used, it should be forced thoroughly into all cracks and crevices.

The chief method of transmitting red mite from one poultry farm to another is per medium of coops and crates. It is therefore essential that these be thoroughly examined on arrival, and, for preference, dipped, or well sprayed with one of the previously mentioned materials.

Fig. 2.—Common louse of the fowl.
[Magnified 37 times.]

## *Lice*

The lice found on the domestic fowl in Victoria are all biting forms, and there are at least six species concerned. These various species are given common names, according to the part of the bird attacked, e.g., there are the common hen lice (Fig. 2.); wing lice (Fig. 3.); body lice (Fig. 4.); head lice (Fig. 5.); and fluff lice (Figs. 6, 7, and 8).

### Nature of Attack

Lice attack both young and adult birds. The injuries caused are largely due to the irritation and itching caused by the insects creeping over and gnawing at the skin. Excessive infestation produces a marked restlessness, which is a serious hindrance to normal growth and development.

Fig. 3.—The wing louse. Left, male; Right, female.

In severe cases, there is a greatly reduced egg production and loss of weight, while brooding hens may be so annoyed as to interrupt incubation. With young chickens, the irritation produced may sometimes be fatal. Abundance of the lice usually accompanies general uncleanliness and overcrowding.

### Hosts

The domestic fowl is the most common host for lice but they may be found on other poultry.

### Description and Life History

Lice are external parasites, and are generally limited to a specific host, with the entire life cycle normally spent on that one host. The female lice lay their eggs either on the feathers or on the base of the quills, and are attached there by means of a sticky secretion. The eggs or "nits" are laid singly over a period of two or three weeks, depending on the life of the adult insect. The incubation period varies somewhat with different species, but, in general, is usually

Fig. 4.—The body louse. 4a, male; 4b, female.

Fig. 5.—The head louse. Left, male; Right, female.

from five to eight days. The young lice emerging from the eggs are similar to the adult except in size, and they moult several times before reaching maturity in three to four weeks.

### Control.

The most satisfactory agent for the destruction of the biting lice on poultry is commercial sodium fluoride. This may be applied by the "pinch" method, when the bird is held on a table and the sodium fluoride applied next to the skin under the feathers, a pinch under the head, one on the neck, two on the back, one on the breast, one below the vent and on the tail, one on each thigh, and one on the underside of each wing; or by the dusting method—three parts of flour to one of sodium fluoride, the powder being dusted on by means of a shaker. In each case the feathers should be ruffled to allow the powder to reach the skin.

Fig. 6.—A fluff louse (G. gigas) (female).

For the treatment of large numbers of birds, dipping is suggested—1 oz. of commercial sodium fluoride to each gallon of water. The birds should be held by the wings and plunged into the solution, ruffling the feathers with the hands. The head should be ducked under twice. Dipping should be done only on warm days, and completed in sufficient time to allow the birds to dry before sunset. For young chickens, the "pinch" method is preferable, small amounts only of sodium fluoride being used.

Generally dipping is quicker and more economical, and 1 lb. of sodium fluoride is sufficient to treat 200 birds. It has the added advantage that the irritating effect on the respiratory tract of the operator (where dusting is practised) is avoided. When dusting, a protective mask over the nostrils and mouth should be worn by the operator. Other materials sometimes used are sulphur and insect powders containing pyrethrum.

Fig. 7.—A fluff louse (G. gallinae). Left, female; Right, male.

A practice now in general use is the application of nicotine sulphate undiluted and applied to the perches before the birds roost, at the rate of ½ oz. to 100 ft. of roost. The fumes from the spray rise through the birds during roosting, and cause the lice to drop from the feathers.

With head lice, particularly on chickens, a non-irritating oil such as castor oil, or vaseline, should be applied directly to the affected area.

## *The Fowl Tick*

(*Argas persicus* Oken.)

The fowl tick is a serious and troublesome pest in most of the warmer parts of the State, while, in the cooler parts, it does not thrive so well.

Fig. 8.—Another fluff louse (G. dissimilis). Left, male ; Right, female.

### Nature of Attack.

The effects of the fowl tick on the birds are often very severe. The ticks, by their feeding, not only cause the birds great discomfort at night with consequent loss of sleep, but also, by the constant blood sucking, produce a direct injury. This is due to the amount of blood actually sucked up by the ticks, and also to poisonous substances injected into the bird while feeding. Young chickens are usually most seriously affected, and the weakness caused in many cases is often fatal.

In addition to this direct damage and loss, the fowl tick is also responsible for the transmission of a harmful organism, which is the cause of tick fever, into the blood of the bird. This disease, which is evidenced by a rise in temperature, restlessness, blackness and shrinkage of the comb, prostration and paralysis, is often fatal among fowls.

### Host.

Hosts of the fowl tick include the domestic fowl, ducks, geese, turkeys, pigeons, ostriches, canaries, wild birds, and cattle.

### Description and Life History.

Ticks in various stages of their growth, together with their eggs, may be found concealed in the cracks and crevices of houses and perches. The eggs, which number from 500 to 900 per female, are of a brownish colour, and about one fortieth of an inch in diameter. They are usually laid in sheltered positions. These eggs hatch out in from three to four weeks from the time they are laid. The newly-hatched ticks measure about one thirty-second of an inch long, have three pairs of legs only, are oval in shape, flattened and with thin edges, and are covered on the upper surface with small pits of various sizes. Their colour varies from brownish to grey-black. They are without eyes.

These young ticks crawl on to the birds and remain attached to the skin for about five days or so. They may be seen in small clusters, blue-black in colour, with their mouth parts inserted into the skin, usually on the breast, under the wing, or on the thighs (Fig. 9.). During this period of growing, they will get enough nourishment to sustain them for a period, and they then seek hiding places in the perches and walls. Feeding occurs only at night.

The adult ticks have four pairs of legs, measure from one-quarter to one-third of an inch in length, and are flat, oval, and grey-black in colour (Fig. 10.). In this stage, they visit the birds at night, and, in from 20 to 45 minutes, become fully engorged with blood, returning then to cracks and crevices in the house and perches.

From the time of hatching, the adult stage may be reached in 30 days. It is well known, however, that the fowl tick will remain for two years or more without recourse to the fowl for food. This fact makes eradication of the pest, once it has become established, extremely difficult.

Fig. 9.—Body of a fowl showing clusters of ticks.

Fig. 10.—Fowl ticks at various stages of growth, and eggs.
[Magnified approximately 3½ times.]

### Control.

The fowl tick is a very difficult pest to deal with, as not only is it resistant to ordinary insecticides, but also its habit of hiding in deep cracks, &c., protects it to a very large extent from any spray treatment.

In those houses which are infested and are not properly constructed, or are of little value, it is better to burn them and rebuild on new ground. The ground where the old structure stood should be saturated with a strong disinfectant. As adult ticks are able to live at least two years in an empty fowlhouse, it is of little use excluding the fowls for any length of time as a control measure. Angle iron should, where practicable, be used in place of wood in the construction of the fowlhouse. For economic reasons, all houses should be built so that, in case of an outbreak, they can be readily dismantled. They should be also built away from any other buildings or structures. Any wood used should be carefully selected, and should be as free from cracks as possible. In any circumstance it should be coated with tar.

The perches, too, should be coated with tar, and they should be made so that they can be easily dismantled, for it is well to remove them regularly, as there is always a possibility of ticks finding a hiding place between the perches, and the walls of the house. The perches can be made so as not to touch the fowlhouse walls by suspending them from the roof on wires, or else placing them on supports rising from the floor.

If fowl tick is present, either crude oil, tar oil, nicotine preparations, sheep dip, or kerosene emulsion, makes a satisfactory spray, and should be thoroughly forced into all cracks and crevices. Before spraying, all litter, nesting straw, and loose boards likely to protect the ticks should be removed and burned. The spraying treatment should be repeated every three or four weeks until no more ticks are seen. Special coops should be set aside so that any newly purchased fowls may be quarantined for a time (usually about ten to twelve days) as a prevention against introducing fresh infestations.

Pepper trees (*Schinus molle*), with their loose bark, have been known to harbor large numbers of the pests. Ticks will travel along an infested fence to a new poultry house, and they and their eggs may at times be conveyed from place to place by egg cases, crates, utensils, &c.

## *Scaly-leg Mite*

(*Cnemidocoptes mutans* Robin and Lanq.)

The scaly-leg mite is the commonest itch mite affecting poultry in Victoria.

### Nature of Attack.

The first signs of attack by the scaly-leg mite are found in the clefts between the toes, and the mites spread forward and upward until the foot and the leg become affected. The two legs are usually attacked at the same time, and show the condition to the same degree. At first there is only a slight roughening of the surface of the legs, but the continued irritation by the mites causes the formation of a spongy or powdery substance under the scales, which become raised and finally easily detached. This proliferation

Fig. 11.—The scaly-leg mite.
[Magnified 100 times.]

and exudation causes a marked irregular thickening of the legs and toes, which are covered with thick, greyish-white crusts (Fig. 12.). Very occasionally, the comb and wattles may be attacked.

Scaly-leg is very readily transmitted from bird to bird.

### Hosts.

Common hosts for the scaly-leg mite are domestic fowls, turkeys, pheasants, pigeons, and cage birds.

### Description and Life History.

The adult mite, which measures only about one-eightieth of an inch in length, is round in shape, and burrows into and lives in the skin. The female mite deposits her eggs in these positions, and, on hatching, the young mites migrate slightly to set up fresh colonies of infection on the same bird, or migrate along the perches, &c., to other birds.

### Control.

The most effective treatment for scaly-leg is to dip the feet and shanks of the affected bird in crude oil, and scrub thoroughly with a hard brush. Care should be taken not to get the oil on the upper parts of the legs or on the feathers. Dipping is best carried out in the morning to allow the oil to drain off before the birds go to roost. Usually one application is sufficient, although in bad cases it may be necessary to repeat the treatment in a month's time.

Washing the legs in soap and water, removing loose scales with a brush, and applying a mixture of lard 9 parts and sulphur 1 part is also an effective treatment. Disinfection of the perches by spraying with crude oil is also recommended as a preventive.

## *The Depluming Mite*

(*Cnemidocoptes gallinae* Railliet.)

The depluming mite lives at the base of the feathers, causing an intense itching, and producing the condition known as "depluming scabies". It infests the portion of the quill lying beneath the surface of the skin, at first on the body and progressing to the neck, thighs, and head. The irritation leads the fowls to pluck out their feathers, the quills of which will be found surrounded by scales and crusts (feather pulling). A bald patch is thus left in the skin which is but little thickened, and remains normally smooth and elastic. The condition frequently spreads rapidly.

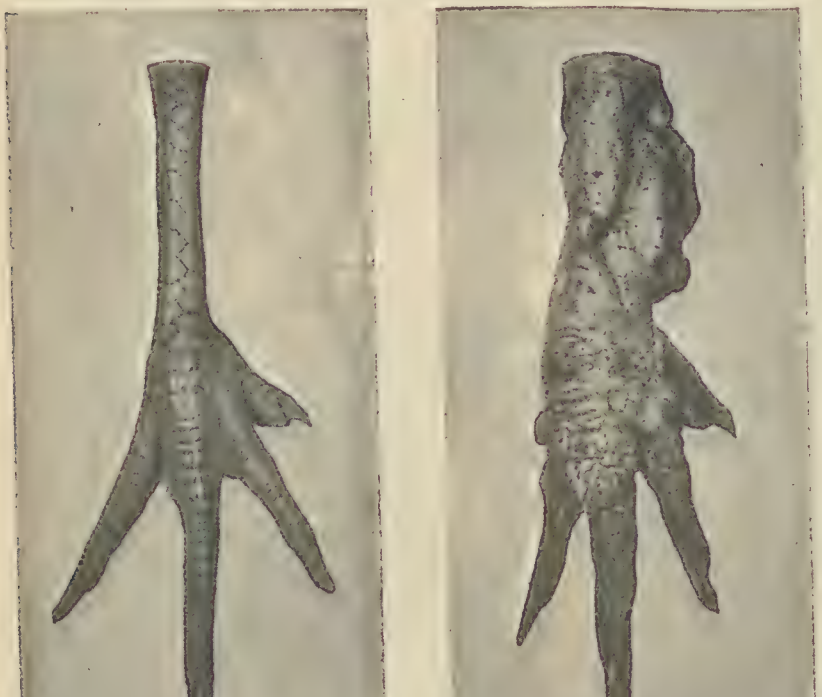

Fig. 12.—Left, healthy shank and foot of fowl. Right, shank and foot of fowl affected with scaly-leg mite.

### Host.

The common host for the depluming mite is the domestic fowl.

### Description and Life History.

The depluming mite is very similar in appearance to the scaly leg mite, but smaller in size. It has a similar life history.

### Control.

The control of this mite is best accomplished by dipping the birds in a solution containing 2 oz. of flowers of sulphur, and ½ oz. of soap to each gallon of water. Lice and depluming scabies may be treated with this bath to which has been added ¾ oz. of sodium fluoride. The application of sulphur ointment to the affected parts is also recommended.

## *The Stickfast Flea*

(*Echidnophaga gallinacea* Westw.)

As previously mentioned, the stickfast flea is present in some Australian States. Poultry farmers in Victoria are advised to watch carefully for the insect, as it is a serious poultry pest.

### Nature of Attack.

On birds the areas that usually are attacked are those devoid of feathers. The insects may be mistaken, at first glance, on poultry for small blood specks on comb and wattles, but closer examination will reveal them as fleas attached to the skin (Fig. 13.). By their constant feeding on the blood of the bird, they may cause death in severe cases, in others diminution in egg production, and general loss of condition.

Infection may be spread from farm to farm by very many means, such as by the movement of old crates, fittings from fowl runs, fowl houses, nesting boxes, poultry and pigeon manure (which harbor the eggs), &c.

Fig. 13.—Stickfast fleas attached to a fowl.

### Hosts.

In addition to poultry, pigeons, dogs and cats, particularly in sandy areas, may be frequently attacked, while less commonly, this flea is found on native birds, horses, rats, mice, and rabbits.

### Description and Life History.

The adult flea is dark brown to almost black in colour, rather shiny, and measures about one twenty-fifth of an inch in length (Fig. 14.). This flea remains permanently on the portion of the body attacked, not moving from one part

Fig. 14.—The stickfast flea. (Enlarged.)

of the bird to another as with other fleas. This habit of remaining firmly attached to one portion of the body has given rise to the name "stickfast". The length of life of the adult flea is dependent chiefly on the availability of food, i.e., blood, and climatic conditions.

The eggs, which are very minute, are dropped by the female flea while attached to the host bird. These hatch in from four to six days during the summer months to small, worm like, white maggots, measuring about an eighth of an inch long when fully grown. These larvae live under the surface of the soil, feeding on partly digested blood which has been evacuated by the adult fleas on the birds, or on the organic matter contained in fowl droppings. The length of life in this stage varies considerably, according to climatic conditions. When fully grown, the larva turns into the pupal or resting stage, in which it lives from fourteen to sixteen days before turning into the adult flea.

### Control.

If a farm has become infested, the following measures are most likely to overcome the trouble.

*Affected Birds.*—The fleas attack the bare parts of the face, the comb and wattles, which should be dressed once a week with neatsfoot oil. The dressing can be applied economically with a small brush. If neatsfoot oil is not procurable use castor, linseed, or other non-irritating oil.

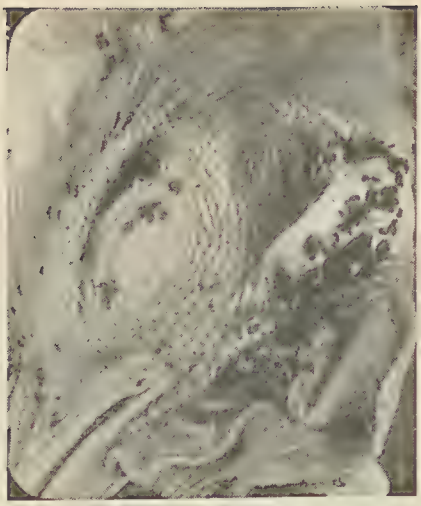

Fig. 15.—A close-up picture of the fowl's head illustrated in Fig. 13 showing the attached stickfast fleas.

*Disposal of Manure.*—The droppings should be removed at least once a week, but more often if possible. If the floor is not paved, an iron tray must be placed beneath the perches to collect the droppings. The fowl manure should be burned, or, if required for fertilizing purposes, be placed in a watertight container and covered with water for seven days before use.

*Yards and Houses.*—The yards, houses, and nests must be kept clean. The yards should be cleaned up once a week and the litter and sweepings burned. It is strongly recommended that the houses should be paved with cement or other impervious material and that the nest be constructed of iron or kerosene tins, raised off the ground and bedded with shell grit or coarse sand. One dressing of quicklime (hot lime) should be given in the houses. Where the floor is of earth, it should be kept, as far as practicable, soaked with water.

*Egg Boxes.*—Boxes used for packing eggs must be kept clean, must not come in contact with poultry, and must not be stored anywhere near the birds.

*Dogs, Cats, &c.*—Oil dressings for dogs and cats should be applied to infested areas as directed for fowls, and the kennels and all bedding should be thoroughly cleaned either by scrubbing or boiling, and then exposed to strong sunlight.

Rabbits, rats, and mice should be destroyed and the carcasses burned or buried deeply.


**References.**

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# Treatment for Worms in Horses

Some of the symptoms of worm infestation in horses are a capricious appetite and consequent loss of condition and a hollowing of the flanks ; a rough coat, apparent anaemia and an irregularity of bowel movement, with a tendency to diarrhoea, which may at times become profuse and very offensive. These symptoms are often met with in the autumn and winter and treatment should be given before the trouble affects the horse's ability to work.

The drug phenothiazine is becoming more popular as a means of destroying intestinal worms in horses as well as in other animals. The drug, which is a greyish-coloured powder, is prepared commercially under the trade names of Phenovis and Phenzeen. It can be given to horses in the feed, as a ball, or mixed in treacle or molasses. If given in the feed, fasting overnight is advisable, but if given as a ball or as an electuary, that is, mixed with treacle or molasses no prior starvation is necessary. In all cases, however, the feeding of a bran mash daily for two days prior to administration is beneficial. If given as a ball, a No. 10 gelatine capsule will hold the dose for a large horse, and a No. 11 capsule for a small to medium horse. To administer as an electuary, mix the drug with treacle or molasses into a thick paste, and smear on the back of the horse's tongue, using a thin, flat, smooth board for the purpose.

The dose of phenothiazine is :—Draught horses—$\frac{3}{4}$ to 1 ounce according to size, Yearlings—$\frac{1}{4}$ to $\frac{1}{2}$ ounce according to size. Repeat the dose in two months.

Unfavorable results may follow the administration of phenothiazine to horses which, as a result of a massive worm infestation, have become debilitated and low in condition. In such cases it would be preferable to use a drench consisting of :—pure turpentine—2 oz., raw linseed oil or liquid paraffin—1 pint.

[Contributed by the Live Stock Division.]

# Chemical Changes in Wheat Resulting from "Bin Scald"

By E. J. O'Brien, A.A.C.I., Cereal Chemist

DURING 1945, as a result of drought conditions and the small harvest, wheat was moved from Western Australia to the eastern States to satisfy milling and stock food requirements. A considerable portion of this wheat, due to prolonged and unsatisfactory storage, had been affected to varying degrees by damage, referred to in this paper as "bin scald", but sometimes called "bin burning" or "heat damage".

The characteristic features of the affected wheat were the pronounced musty odour and the presence of kernels whose colour had been materially darkened. These kernels varied in shade from light to mahogany brown and, in the latter case, the darkening had extended into the endosperm. The modification of the odour and the appearance of the wheat prompted a survey of the available literature and a chemical examination of some of the badly affected wheat.

In the absence of precise information regarding the original moisture content of the wheat or detailed storage conditions, no attempt could be made to trace the extent of damage in relation to moisture content. The scope of this investigation, therefore, is limited to the chemical changes which occurred in the wheat as a result of bin scalding, and the consideration of published data relative to causes and means of preventing similar damage.

## *Causes of Bin Scalding in Stored Wheat*

It has been long known that damp wheat which is stored in bulk is liable to heat, with consequent spoilage. Swanson (1938) suggests that there is a very narrow range in moisture content at which wheat will develop heat. The lower level of this moisture range is closely related to the outdoor temperature. Swanson and Fenton (1935) during a survey of extensive storage experiments found that, with metal bins exposed to the direct rays of the sun, wheat was likely to heat at 14 to 14·5 per cent. moisture. Davidson (1940) adequately reviews the wheat storage problems of South Australia and gives detailed consideration to the effect of temperature and moisture content on the development of insect infestation and on the respiration of the grain.

Heating of wheat results from the respiration of the grain and the action of the associated bacteria and moulds which flourish in damp, warm conditions. Respiration in its widest sense can be defined as the gaseous exchange between an organism and its environment, but obviously it is also a vital metabolic process in

the living organism. During aerobic respiration of wheat, oxygen from the air diffuses to the cells where oxidation of organic substances, particularly sugars, takes place. This oxidation reaction is exothermic and may be illustrated by the following equation (Lindgren (1935) ) :—

$$C_6H_{12}O_6 + 6O_2 = 6CO_2 + 6H_2O + 677{\cdot}2 \text{ calories.}$$

Since wheat is an exceedingly poor conductor of heat, the heat produced by respiration raises the temperature of the grain and, if storage is prolonged, may cause serious damage. The major variables upon which the rate of heating is dependent are (*a*) moisture content of the wheat, (*b*) temperature of the wheat, (*c*) carbon dioxide content of the surrounding air, and (*d*) insect infestation.

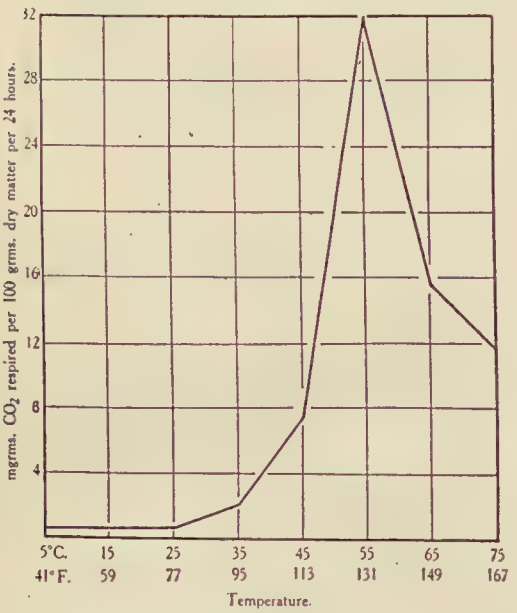


Fig. 1—The graph shows the relationship between temperature and $CO_2$ respired.

## (a) Moisture Content of the Wheat.

Bailey and Gurjar (1918) studied the first three of these variables. They found that the rate of carbon dioxide production was gradual up to 15 per cent. moisture, while from 15 to 17 per cent. it was rapid. The rate of respiration of hard wheat was less than soft wheat, while shrivelled wheat, frosted wheat and wheat which had been dampened for some time respired more rapidly than normal wheat. From the amount of carbon dioxide respired at various moisture levels 1 per cent. apart, they calculated the respiration rate. Table 1 shows a summary of their results, where—

$K_m$ represents the respiration value at a particular per cent. moisture;

$K_m - 1$ represents the respective value of the same wheat at 1 per cent. less moisture.

Table 1.—Influence of Moisture Content on Rate of Respiration.

| Formula. | Respiratory Ratio at Various Moisture Contents. | | | | |
|---|---|---|---|---|---|
| | 12–13 per cent. | 13–14 per cent. | 14–15 per cent. | 15–16 per cent. | 16–17 per cent. |
| $\frac{K_m - (K_m - 1)}{K_m - 1}$ | 0·16 | 0·17 | 0·66 | 1·41 | 3·02 |

Bailey (1917) advanced a hypothesis to account for the relation of moisture to the rate of heating. He suggested the formation of a continuous gel at a moisture content dependent upon the gluten content of the wheat. A condition such as a diminishing rigidity of the cell protoplasm resulting from an increase in moisture content facilitates diffusion, and hence accelerates the rate of respiration.

Coleman and Rothgeb (1927) placed wheat samples adjusted to various moisture contents in closed containers, which were stored in an incubator maintained at 98–100° F. for 90 days. At the end of this time, the wheat was spread out and examined as indicated in Table 2.

Table 2.—Effect of Heating Wheat at Various Moisture Contents at 96–100° F.

| Moisture. | Heat Damage (Bin Scalding). | Dry Gluten. |
|---|---|---|
| % | % | % |
| 13·8 | 0·0 | 9·1 |
| 15·1 | 0·5 | 5·4 |
| 17·0 | 25·3 | 1·2 |
| 18·5 | 47·6 | 0·0 |

The results show that the damage to the gluten may be greater than the apparent damage to the wheat because, in the sample from which no gluten could be washed, the number of grains apparently damaged was less than half the total.

### (b) Temperature of the Wheat.

Fig. 1 indicates the relationship between respiration rate and the temperature of the grain. It is seen that the rate of respiration is slow up to 77° F., at 95° F. the rate as determined by the carbon dioxide respired is three times as fast as at 77° F., while an upper limit is reached at 131° F. The wheat used by Bailey and Gurjar in this trial had a moisture content of 15·0 per cent., which is slightly above their determined value for the critical moisture content. They found that some kernels became discoloured at 95° F., while at 131° F., the whole mass turned a mahogany colour. At 149° F. the respiratory enzymes had been partially inactivated, while at 167° F. this inactivation had proceeded still further and some roasting of the wheat had taken place.

### (c) Carbon Dioxide Content of the Surrounding Air.

Bailey and Gurjar also noted a reduction in the rate of respiration with an increase in the carbon dioxide content of the air in the interstitial spaces between the wheat grains. Since increase of carbon dioxide content, resulting from aerobic oxidation, causes a reduction in the oxygen content, the changes observed in the rate of respiration may be associated with the amount of oxygen in the air.

### (d) Insect Infestation.

Lindgren (1935) considered the respiration of weevils and its relation to the broader aspect of heating of the grain. From the exothermic reaction for the oxidation of sugar, it is seen that heat, water and carbon dioxide are being produced continuously. Portion of this heat is used by the insects, but portion is available for raising the temperature of the grain. The production of metabolic water is also significant since Lindgren calculated that for each 2·9 grams of carbon dioxide, there is also produced 1 gram of water. He states that at 25° C. it would take 70 granary weevils 100 days to raise the moisture content of 100 grams of wheat 1 per cent. in moisture. The same amount of wheat at its critical moisture level would take from 15 to 30 times as long to produce this amount of moisture. It can thus be seen that weevil infestation can raise both the moisture content and the temperature, bringing about conditions favourable for a rapid increase in the respiration of the wheat with the inevitable destruction of a considerable percentage of the stored grain.

## *Sources of Samples Examined*

Although samples containing less than 0·5 per cent. of bin-scalded wheat had, from time to time, been examined to assess their suitability for milling, the comparative rarity of badly damaged grains precluded a critical examination. The sample which was eventually selected was unfit for human consumption and was intended solely for the preparation of stock food. From a large quantity of this wheat, three samples were selected.

A.—A representative sample of the wheat under consideration.

B.—A selected sample containing no darkened grains and visually indistinguishable from sound wheat.

C.—A selected sample of darkened grains manually removed from a large amount of wheat as represented by A.

TABLE 3.—PHYSICAL CHARACTERISTICS AND CHEMICAL COMPOSITION OF BIN-SCALDED WHEAT.

| Sample. | Apparently Sound Kernels. | Heat-damaged Kernels. | Weight per 1,000 Kernels. | Moisture. | Pelshenke* Figure. | Calculated on a 13·5 per cent. Moisture Basis. | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Crude Protein $N_2 \times 5{\cdot}7$ per cent. | Fat Acidity mgrms. KOH per 100 grams. | Starch Percentage (Rask Method). |
| | % | % | Grams. | % | Mins. | % | | % |
| A .. | 92·7 | 7·3 | 0 | 10·7 | 86 | 9·5 | 64·0 | 58·4 |
| B .. | 100 | 0 | 39·0 | 10·7 | 87 | 9·5 | 56·4 | 61·7 |
| C .. | 0 | 100 | 36·3 | 10·7 | 0 | 10·3 | 114·5 | 52·8 |

* This test was conducted at 32° C.

TABLE 4.—CHEMICAL ANALYSIS OF FLOUR PREPARED FROM BIN-SCALDED WHEAT.—EXAMINATION OF PROTEIN.

| Sample. | Crude Gluten. | | Crude Protein $N_2 \times 5{\cdot}7$ per cent. | Gliadin. | Glutenin. | Protein Sol. in 5 per cent. $K_2SO_4$. | Mgrms. $N_2$ as Amino Acid per 100 Grams. | |
|---|---|---|---|---|---|---|---|---|
| | Wet. | Dry. | | | | | Original. | After 24 Hours Digestion. |
| | % | % | % | % | % | % | | |
| A .. | 16·2 | 6·5 | 8·6 | 4·1 | 2·8 | 1·1 | 9·8 | 23·0 |
| B .. | 18·5 | 6·9 | 8·2 | 4·2 | 3·0 | 1·2 | 9·5 | 25·0 |
| C .. | 0 | 0 | 9·3 | 2·7 | 0·2 | 0·8 | 27·0 | 37·6 |

NOTE.—All the above results are calculated on a 13·5 per cent. moisture basis.

The wheat represented by these samples had been stored for several years in bulk in a region of high atmospheric temperature. Weevil infestation was a major problem and consideration of this aspect and also lack of man-power did not allow for aeration or turning the wheat. Consequently, conditions were ideal for cumulative spoilage.

## *Experimental*

### Critical Examination of Wheat.

Table 3 indicates the physical characteristics and chemical composition of the three samples of wheat; unless otherwise mentioned the analytical methods in this and following tables are those given in Cereal Laboratory Methods (1941).

The amount of damage in sample A, which could be visually assessed, was determined by selecting the brown grains and weighing. However, it will be realized that this selection was most incomplete since the results in Table 2 and following tables indicate that all the samples are damaged and, in reality, sample B does not consist of 100 per cent. sound wheat.

The moisture content of all three samples was 10·7 per cent., which was to be expected, since ample opportunity existed for equilibrium to become established. Consideration of the Pelshenke figure (wheatmeal fermentation time), and the quantity of protein indicates that at the time of storage, this wheat was of the medium strength group with a somewhat low protein content. In comparing samples B and C, it is noted that while crude protein has increased, starch and the weight per 1,000 kernels has decreased.

Shutt (1909) analysed wheat at the beginning and end of a storage period of 16 months and noted a slight increase in the percentage of protein. He attributed this to the slow oxidation of carbohydrate during storage. On the other hand, Coleman and Rothgeb (1927) in their examination of bin-burned wheat did not note any change in protein content. It may, therefore, be concluded that the process of respiration has proceeded much further in Sample C than in the case of wheats examined by the other workers cited. The substantial increase in fat acidity above normal, and above the arbitrarily selected figure of sample B, is in line with the findings of Zeleny and Coleman (1938) whose method was used in this investigation. They report a normal acidity of 15 milligrams of KOH required to neutralize the acids from 100 grams of wheat; this figure is in conformity with the average fat acidity for fresh samples of Victorian wheat. Swanson (1938) is of the opinion that this acidity figure constitutes the best measure of the extent of heat damage in wheat. He states that the presence of an acidity above normal is proof positive that the wheat has suffered damage, but an acidity which is near normal for sound wheat is not proof positive that no damage has taken place.

### Critical Examination of Flour.

The three samples of wheat were milled on a laboratory roller mill to give a flour yield of approximately 70 per cent. The bran of sample C was very brittle and, consequently, the flour made therefrom was correspondingly contaminated —the colour, due to bran and also due to the darkened endosperm, being of an amber shade. The other two flours were approximately normal in appearance although the ash figures for all three flours are high.

TABLE 5.—CHEMICAL ANALYSIS OF FLOUR PREPARED FROM BIN-SCALDED WHEAT.—EXAMINATION OF CARBOHYDRATE.

| Sample. | Starch. | Non-reducing Sugar Percentage Sucrose. | Reducing Sugar Percentage Maltose. | Determined Diastatic Activity Percentage Maltose. | True Diastatic Activity Percentage Maltose. | Crude Fat. | Crude Fibre. | Crude Ash. |
|---|---|---|---|---|---|---|---|---|
| | % | | | | | % | % | % |
| A .. | 72·8 | 1·98 | 0·25 | 0·96 | 0·71 | 1·09 | 0·41 | 0·49 |
| B .. | 73·3 | 1·98 | 0·23 | 0·99 | 0·76 | 1·09 | 0·41 | 0·46 |
| C .. | 68·5 | 1·25 | 0·70 | 1·38 | 0·68 | 1·09 | 0·53 | 0·65 |

NOTE.—All the above results are calculated on a 13·5 per cent. moisture basis.

### Changes in Protein.

Table 4 shows the protein degradation which has taken place and, within the limits of the experimental methods for individual protein determination, may offer some clue as to the reasons for deterioration of flour quality with increasing age.

The damage from heat is shown by injury to the colloidal properties of the proteins which go to form gluten. Hence the crude gluten is reduced in order of increasing damage from 6·9 per cent. to zero. Corresponding to the decrease in gluten, the total crude protein, or more correctly the total nitrogen content, shows an increase as result of carbohydrate loss during respiration. Increasing heat damage can also be identified by reduction in the percentages of glutenin, gliadin and protein soluble in 5 per cent. $K_2SO_4$ solution, while the amino acid content as determined by the modified Sörenson formol titration method shows a substantial increase. It is interesting to note that after digestion for 24 hours at 40° C. proteolysis caused a greater amino acid formation in A and B than n C.

It is possible that the temperature to which sample C had been subjected partially inactivated the proteolytic enzymes. To some extent this is confirmed by Kent-Jones (1939), who states that the proteolytic enzymes are more sensitive to heat than are the diastatic enzymes with which they are associated. He considers that this may be a partial explanation of the improvement of certain flours when they are subjected to controlled heating.

### Changes in Carbohydrate Resulting from Respiration.

Table 5 shows the determined amounts of carbohydrate and diastatic activity in the flour; all figures are calculated as percentages to facilitate comparison.

While the nitrogen content of the flour has increased, it is observed that the starch and the sucrose content has been significantly reduced; also the amount of reducing sugars has increased while the diastatic activity has remained practically unaltered. Swanson (1938) showed that heating at a temperature of 100° C. for 21 hours would reduce diastatic activity, but would not destroy it, whereas the viability of the grain was totally destroyed. The viability of all the wheat used in this study was zero, but it is impossible to say whether this was a result of age or heat or of both. However, this does not seem to have affected the functioning of the diastatic enzymes which have converted an appreciable portion of the starch to maltose and, apparently, are capable of further conversion, under optimum conditions. The increase of crude fibre and ash probably bears no relationship to the destruction of starch, except in so far as it indicates the general heat damage, which has resulted in a brittle bran.

### Baking Results.

Although wheat of this quality would not normally be used for milling because of the unpleasant odour and flavour, a baking test was performed in order to determine the maximum amount of badly bin-scalded grain that could be tolerated in a blend without seriously impairing

the major characteristics of a bread flour. To this end a series of four flours was made as follows :—

No. 1—From sound wheat, the flour being slightly immature.

No. 2—95 per cent. of No. 1 + 5 per cent. of Flour, Sample C.

No. 3—100 per cent. of Flour, Sample A.

No. 4—50 per cent. of No. 1 + 50 per cent. of Flour, Sample B.

Standard baking procedure was adopted with the malt phosphate additions. Gassing power tests indicated that gassing was adequate, and would be maintained for the duration of the test. After an initial proof, loaves were scaled at half-hourly intervals and given the normal tin-proof and baking. As was expected from a consideration of the analytical results, Flour No. 3 gave a totally unsatisfactory loaf with a heavy dark-coloured crumb and an offensive odour. Flours Nos. 2 and 4 produced surprisingly satisfactory bread and were only slightly inferior to Flour No. 1. The musty odour was noticeable in the dough at all stages and in the finished loaf, but apart from imparting a lifeless feel to the dough and causing maturity to occur earlier than with the Flour No. 1, the loaves indicated that the presence of bin scald in a wheat does not necessarily mean that baking qualities are totally destroyed, particularly where blending with sound wheat is possible. The fact that bread can be produced from a mixed flour containing 5 per cent. milled from badly bin-scalded grain, confirms an earlier observation regarding the absence of excessive proteolytic activity; but because of modifications to the odour and flavour, this would constitute an upper practical limit to the percentage of badly bin-scalded grain, which could be tolerated in a mill blend. Wheat which has been damaged to a lesser extent may be used as a much larger fraction of the total wheat milled without causing an appreciable reduction in the baking properties of the flour, but it should be realized that only under extraordinary circumstances could such a course of action be recommended. During the past year, large amounts of mildly heat-damaged wheat have been used in Victoria to satisfy normal milling requirements, but since it has been used in conjunction with sound wheat, the general baking characteristics of the flour produced have not been appreciably altered.

### *Methods for Detecting Bin Scald*

Examination of the foregoing results shows that most constituents of the wheat are either altered or reduced in quantity by respiration or by the effect of the high temperature to which the wheat has been subjected. It has been suggested by Frank (1922) that failure of the gluten to agglutinate may be regarded as evidence that the wheat has been heat-damaged. Although this is correct, the test does not differentiate between degrees of damage and it seems to disregard the most important features of damaged grain—odour and flavour. These two properties are very difficult to assess and yet they can be substantially modified before the gluten fails to agglutinate. The fat acidity of the grain appears to give definite evidence of damage and this may be, to some extent, associated with both the odour and flavour.

### *Control Measures*

It is obvious that damage will result when grain of high moisture content is subjected to prolonged bulk storage. Similarly, it has been established that weevil infestation can bring about conditions favorable for the rapid heating and consequent spoilage known as bin scald. The former cause can easily be prevented by exercising control over the initial moisture content while the latter problem is more difficult to solve.

Wilson (1945) reports that weevils are restricted in their activity to the periphery of the bulk wheat as a result of the development of a combination of temperature and moisture conditions within the wheat mound, lethal to the insects. Consequently, aeration and turning of the wheat would considerably increase the damage resulting from weevils although it would prove beneficial to the wheat. Gay (1941) studied the temperature changes due to running the wheat from one bin to another. It was found that during the summer very little alteration to the mean temperature took place, but that during the winter the mean temperature was lowered appreciably. However, in both cases, the most important effect of the turning process was to break up pockets showing dangerous extremes of temperature and so produce a more uniform temperature in the wheat.

It would appear that the logical method to obviate the development of heat damage is to utilize either fumigants or lethal dusts to control insect infestation, and to turn the wheat at regular intervals in order that hot pockets do not develop.

## *Summary*

A study has been made of the chemical changes occurring in wheat resulting from respiration and heat and known as "Bin Scalding". It has been found that as a consequence of respiration, the quantity of carbohydrates has been reduced, while the total nitrogen has increased. Meanwhile, cleavage of the proteins has taken place and the colloidal properties have been substantially modified. Baking tests indicated that odour and flavour were the major factors limiting the incorporation of bin-scalded wheat in a mill blend. Relatively large amounts of slightly damaged wheat can be used in this way without the quality of the baked products being significantly reduced. Published data relative to the causes and means of preventing this damage have been reviewed.



### Acknowledgments.

The writer acknowledges the co-operation of Messrs. Stratton and Co. Pty. Ltd., which firm allowed its grain store to be thoroughly sampled in order to obtain the material for this investigation. The assistance of Mr. M. Jackson and Miss M. Matthews, who performed part of the analytical work, is also acknowledged.


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## LIVE STOCK NOTES—*continued from page 467*

Two swarms in the air at the same time can usually be kept apart if the spray is worked between them when they first emerge from the hives.

When swarms are hived, it is the usual practice to insert a frame of brood of all ages. Swarms at times even abscond when this is done. A comb of partly sealed honey will often be successful in holding a swarm that persists in leaving a set of foundation comb.

Hives that are to receive swarms should never be left in the hot sun, and should be free of the fresh paint odour.

Swarms hived on drawn worker combs seldom abscond. If they persist in swarming out, close the swarm up in a screened box in a cool place, and attend to them after all bees in the apiary have finished flying. They will generally settle down overnight in the new hive.

The Manum swarm catcher is a handy appliance to have around the apiary. It is a fly-wire receptacle, with an extension handle, and controllable lid, into which the swarm can be bumped from a high limb. When swarms settle on posts, and box-thorn hedges, or walls, an easy way of removal is by dipping the bees off with a small tin or pint pot, and placing them in or right in front of the hive. Once the queen is in the box the bees will soon follow. The swarm can be carried to its permanent location at once, as any bees that are left behind will return to their old hive.

If a dearth of honey happens a few weeks after swarming, as is often the case when Cape weed dies off, it is wise to supply the swarms with stores until they become thoroughly established.

[W. A. Collins, Apiary Inspector.]

# THE FLOWER GARDEN

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley Gardens

### *Dahlias*

THE dahlia has such a long flowering season and contains so many variations of form and colour, and is so suitable for indoor decoration as well as for garden displays, that it rightly deserves its prominent place in the home garden.

Most home gardeners like to introduce a few new dahlia varieties each year. They do this either by exchanging tubers with their neighbors or friends, or by purchasing green plants or tubers from seed shops or dahlia specialists. Old varieties are popular, but many home gardeners find that after several years in their garden, these varieties fail to maintain their flowering qualities. Sometimes this is due to a general lack of soil fertility in the particular garden, for it must be remembered that the dahlia, with perhaps the possible exception of the Pompone type, requires rather more generous manuring than the average home gardener is prepared to give it. The home garden must submit to a very intensive form of horticulture, and quite frequently spring, summer and autumn displays are expected. To maintain this succession of growth, it is essential to be particularly careful to maintain the soil fertility by constantly adding those plant foods which are being used up. Nitrogen, phosphorous and potassium are the three main ones, and these, together with large amounts of organic matter, should be replaced in the soil before each planting.

Another cause for the decline in vigour of dahlias is the presence of a virus disease which frequently affects the plant by causing a mottling of the leaves and a dwarfing of the plant, and in severe cases, may almost prevent the plant from blooming. Any plants so affected in the garden should be discarded at once. The virus remains in the tubers, and if affected plants are replanted, the symptoms of the disease will become apparent again the following season. If these clumps of tubers are used for the propagation of green plants by means of cuttings taken from them, such cuttings will also be affected by the virus.

Unfortunately many home gardeners do not realize the seriousness of obtaining virus free plants, and hence we hear the term that such and such a variety of dahlia is "running out." Actually, disease is carrying off this variety and careful selection of the parent plants is necessary in order to retain a healthy stock of this particular variety. New seedlings when they come on the market for the first time are generally vigorous, because they have been propagated, in almost every case, from virus free plants. After a few years cultivation, they in their turn become infested by the virus and the so-called running out of the variety commences. Those who are fortunate enough to have plants which have not become virus infected, can retain the stock of this variety for a number of years.

#### Planting.

Green plants, that is those propagated by cuttings and grown usually in a 3-inch pot and bought as such from seed shops and nurserymen, should be tapped out of the pot and planted in well prepared soil, against a stake already in position in the ground. A little light shading over the plant should be provided by prunings from trees or shrubs, or by a piece of board placed on the sunny side of the stake. As soon as elongation of the stem occurs, it should be tied to the stake in order to support this tender growth. Space the plants about 3 feet apart.

Tubers should be planted about 3 inches deep, with the bud or shoot end about 1 inch from the stake. Prior to planting, the soil should be thoroughly watered and excess water should have drained away. After planting, do not water again until good growth is noticed. Keep the surface soil stirred around the plant to reduce weed growth. This cultivation should assist in retaining moisture for the early growth of the plant.

When planting pieces of tuber, it is essential that they should have at least one good eye or shoot visible. It is not advisable to replant the whole clump of tubers because this results in very little space for new tuber formation. Remember always that the dahlia feeds in the surface soil, and subsequent cultivation must be very shallow, and a mulch of manure or compost should be provided during the summer.

### *Hydrangeas*

Many gardeners desire to intensify the colour of their hydrangeas, and the method adopted is quite simple, but requires care. One of the solutions used to intensify the blue colours is made by mixing six parts of alum with one part of iron sulphate and dissolving this at the rate of ½ oz. to one gallon of water. This can be watered on the plant once a week.

For those who desire to intensify the pink and red colours, an application of lime or wood ashes to the surface soil at the rate of 2 or 3 oz. to the square yard will be found helpful.

The soil around the plants should be very lightly pricked over with a fork if there is a tendency for the surface soil to form a crust and a mulch of fresh stable manure may be spread over the surface, or a thin mulch of fowl manure containing plenty of litter, may be applied to the surface soil.

### *Azaleas and Rhododendrons*

After flowering, the azalea and rhododendron beds should be lightly forked over and a light application of blood and bone manure at the rate of 2 oz. to the square yard can be applied. Follow this with a mulch of decayed cow manure or leaf mould, to keep the root areas cool and moist during the summer. On no account apply lime to these plants as they enjoy an acid soil.

### *Seed to Sow*

Seed of petunia, verbena, salvia, zinnia, phlox, gaillardia, portulaca and amaranthus may be sown now that the ground has become sufficiently warm. Fine seed like petunia and portulaca is often mixed with three or four times its volume of fine sand, in order to get a thin, even distribution of seed. Phlox, portulaca and amaranthus may be sown in the garden where they are to remain, and subsequently the plants can be thinned out to the required distances apart.

There are two forms of Amaranthus, one form called *Salicifolius Improved*, is commonly called the Fountain Plant, and grows to a height of 5 or 6 feet, and has long, narrow pink foliage.

The other form, *Tricolor Improved*, is known as Jacob's Coat, because of the many colours which occur in its foliage. The leaves are coloured brilliant yellow, red and green, and under good conditions this plant may grow about 3 feet high, but more likely 2 feet would be the limit in southern Victoria.

## *THE VEGETABLE GARDEN*

### *Tomatoes*

Last month mention was made in these notes of the necessity for thorough preparation of the soil before planting tomatoes. The tomato likes plenty of organic matter in the soil but nitrogenous manure must be carefully applied. Too much nitrogen will cause excessive growth, and tends to prevent heavy cropping. Blood and bone manure used at the rate of 3 or 4 oz. to the square yard, together with 1 oz. of superphosphate to the square yard, should be sufficient.

One point often overlooked by gardeners is the necessity for rotation to be practised in the home garden. The continuous planting of one type of vegetable in the same bed, builds up trouble from fungous diseases, insect pests, and also reduces soil fertility. With tomatoes, it is particularly necessary to put them in a different part of the garden each year, because some of the fungous diseases which attack these plants, remain in the soil.

#### Planting.

Set the young tomato seedlings deeply in the soil so that the lowest leaf is just above the soil level. The tomato plant forms roots from the stem buried in the soil, and these new roots when produced grow through the rich surface soil. To encourage this root production, keep the surface soil moist and do not cultivate deeply near the plants, and remove all weeds as soon as they appear. Later in the season a mulch of well-decayed manure can be placed around the plants to keep the surface soil moist and cool.

[*Continued on page* 489.

# IN THE ORCHARD

By G. W. GAYFORD, B.Agr.Sc., Horticultural Instructor

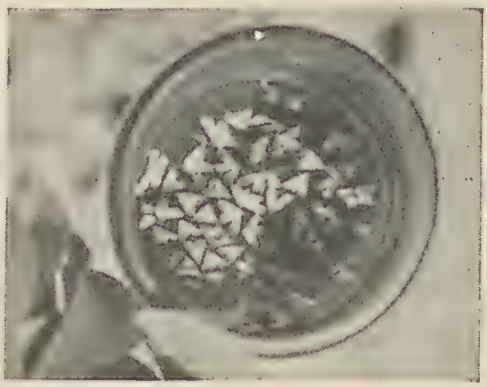
## *Codling Moth Control in Apples and Pears*

THE spring months are undoubtedly the most critical in codling moth control. Unless strenuous measures are adopted during the early part of the season for the control of infection, the moth population can build up into large numbers and cause serious damage later when control is more difficult. The extent of infection early in the season is not always apparent because small infected fruit drop from the trees and the number damaged is not noticed, particularly when there is a heavy crop such as that expected this season.

The main points in successful control during the next few weeks are to spray thoroughly and at the right times. At this period, there is no better spray available than the combination lead arsenate-white oil emulsion spray. There is no evidence that it is worthwhile increasing the strength of lead arsenate above 3 lb. powder or 6 lb. paste in 100 gals. water. The strength of white oil emulsion for the combination spray should be ½ gallon in 100. Those growers who find it necessary to continue to use lime sulphur for the control of black spot on apples, should not use an oil spray earlier than three weeks after the lime sulphur spray, otherwise the foliage and fruit on trees may be damaged.

One of the chief reasons for the inefficient spraying of a heavy crop of apples is the failure to cover the fruit completely with spray material because the fruit hangs in clusters. If the time and labour are available, the efficiency of the lead arsenate cover will be greatly improved by thinning the fruit so that only one apple remains in each bunch.

Getting the spray material on the fruit when it is most needed is also highly important. Moths are usually actively egg laying on warm evenings when the temperature at sunset is over 60° F. The activity of spring brood moths extends into November and growers should be prepared to thoroughly spray their trees at least twice this month. As an indication of the number of moths which are emerging, lures have been established in each district. These are checked twice a week and provide information from which district Orchard Supervisors are able to advise growers by means of circulars, when sprays are most needed. As the period between the laying and the hatching of the eggs may be shortened to 5 or 6 days in warm inland districts, it means that a spray must be applied within this time after a peak emergence in order that the fruit will be protected. Some growers have installed their own lures of apple juice, cider, waste wine lees, &c., and find these of much assistance in timing sprays. To be useful, they should be checked regularly and frequently, every day if possible, and refilled with fresh lure material every week.



Lure containing codling moths.

### Tree Bandages.

As a subsidiary control measure, the bandaging of the trunks of trees with pieces of bag or chemically impregnated corrugated cardboard is of value in trapping grubs which are leaving infected fruit. This practice loses its value when the trunk is covered with loose bark or there are numerous cracks in the limbs which offer alternative cover for the grubs to pupate. Scraping the trunks and branches and filling all cracks is a necessary preliminary job to applying bandages. Bandages should be attached to the trees not later than the end of November and

bag bandages should be regularly examined thereafter every 8 to 10 days and the grubs destroyed.

### *Peach Rust*

Growers of canning peaches should be on the watch for the appearance of peach rust on the leaves at this time of the year. The presence of this disease can be recognised by small brown raised spots on the leaves. The most serious effect is produced on the fruit in the form of dark green depressions which remain hard when the fruit ripens and spoil it for canning purposes. Fruit infection may follow a heavy leaf infection, particularly if showery weather occurs from December onwards. Fruit infection rarely develops earlier than December. For control, a spray of dry mix lime sulphur may be made by mixing 16 lb. finely divided sulphur with 8 lb. slaked lime and 1 lb. of lime casein spreader. This mixture is made into a paste with water and diluted in 100 gals. water.

Bag band for trapping codling moth larvae.

## THE VEGETABLE GARDEN—*continued from page 487*

Unpruned bush varieties of tomatoes should be planted about 2 to 3 feet apart, while those which are pruned and are grown on stakes, can be spaced 18 inches to 2 feet apart. Staking can be practised for all varieties of tomatoes. It is an advantage because it reduces the amount of damage caused by the larvae of the tomato moth. Varieties like *Tatura Dwarf Globe, Burwood Wonder, Orange Prolific,* and *Mortgage Lifter* are usually unpruned and tied to short stakes about 4 feet long. The tall growing types which are pruned, such as *Earliana, Red Marhio, Marglobe, Walker's Recruit and Eccles Surprise,* require longer stakes and these should be about 6 feet long.

#### Diseases and Pests.

It is only possible to mention in these notes a few of the more common diseases and pests of the tomato plant. For growers who require more information on tomato growing generally, as well as on the control measures for these diseases and pests, it is suggested that they obtain a copy of the Department's bulletin, "Tomato Culture", which will be forwarded post free on receipt of the sum of 1s. Applications should be addressed to the Director, Department of Agriculture, Melbourne, C.2.

All virus diseased plants should be removed and burned as soon as the symptoms are noticed. A good plan is to spray tomato plants occasionally with a Bordeaux Mixture spray 4 : 4 : 50, or approximately 4 oz. bluestone, 4 oz. freshly slaked lime, and 2½ gallons of water.

The Spotted Wilt virus is conveyed from plant to plant by means of a species of thrips, and it is therefore of some help in controlling this disease if the thrips population in the garden is reduced to a minimum, and alternative host plants of the virus are also removed as soon as the disease is noticed on them.

Mosaic virus also affects tomato plants. The leaves become mottled and often puckered, distorted and rolled. This disease may be transmitted by the pruning knife or by the hands of the gardener, and therefore it is important to prune and handle the healthy plants first before handling diseased plants.

Aphids on tomato plants should be controlled by nicotine dusts or sprays.

Cutworms frequently attack young tomato plants. These caterpillars live in the ground and come up to feed at night. The first signs of their damage is that the stems of young succulent plants are cut off neatly near ground level. The stems of older plants may show a gnawed appearance. To control this pest, small pieces of poison bait, made by mixing 1 oz. of Paris green, 1½ lb. Bran and ½ oz. salt with 1½ pints of water, plus a little lemon juice, should be placed near the plants in the evening. Keep domestic animals away from the baits.

The development of weeds in a pasture occurs in the absence of strong competitive growth by pasture plants, and indicates faulty management. If the weeds are those that do not demand high fertility in the soil such as flat-weed, cud weed, sorrel and the like, the obvious fault is failure to improve soil fertility either by not top-dressing or by using the wrong fertilizer. In general, superphosphate must be used, but in some circumstances other fertilizers such as potash and lime are needed in addition. Sorrel often flourishes on soil that needs lime but not always so as it grows also in places where only phosphate is needed to restore fertility, and it therefore should not be assumed that liming is essential in its eradication.

In contrast to the "low-fertility" weeds, such species as cape weed, thistles, storks bill and mustard flourish under conditions of high fertility, and are ever ready to invade land whose fertility is naturally high or has been increased by means of pasture improvement.

To prevent the development of these weeds, it is necessary to have a vigorous perennial grass in the pasture that will keep the sward closed, particularly in the autumn. This means that not only is it desirable to introduce the appropriate perennial grass but that it should be maintained in a vigorous condition by proper management, which calls for regular top-dressing and regulated grazing.

Heavy and continuous defoliation of perennial species depletes their root reserves and the plants may then succumb to unfavorable environmental conditions more readily than if they were in a vigorous and healthy condition.

An essential point in grazing management is to allow plants a reasonable period for recovery after grazing and the necessary interval varies according to rate of pasture growth which in turn depends upon temperature, moisture, and soil fertility.

One might aim at something like four to five weeks interval between grazings as an average resting period and modify this by shortening the period in the springtime and extending it when pasture growth is slow. To exercise any rigid control of this nature, adequate subdivision and fodder reserves are essential.

On a dairy farm of about 112 acres carrying 30 cows, paddocks of about 16 acres would be a reasonable size to have. This would allow six grazing paddocks and one for cultivation. If the cows spend a week in each grass paddock in rotation this would permit the pasture an average resting period of five weeks. During a normal spring probably two of the grazing paddocks could be shut up for silage and/or hay and the resting period of the others shortened to three weeks, whereas during the early autumn and mid winter this period might be extended to eight weeks and the conserved fodder used to supplement the grazing.

### Fodder Conservation.

Live stock farmers ordinarily depend upon fodder crops such as oats, millet, maize, sorghum, root crops and surplus pasture growth to "bridge" the difficult periods throughout the year.

The cheapest form of fodder is conserved pasture herbage and as pastures improve a greater spring surplus becomes available. Whether it be conserved in the form of silage or hay depends largely on the facilities available for handling the material and climatic conditions.

Silage undoubtedly has certain advantages in that it is succulent, easily digested and safe against

Bracken after the fern-crusher has passed over it. The bruising of the stems has a more weakening effect on the plants than cutting with a mower.

The cheapest form of fodder is conserved pasture herbage. Improved pastures provide a large surplus of herbage for conservation.

fire but about four times the weight of material has to be handled compared with meadow hay, to give the same amount of nutriment.

If facilities are available for bulk-handling of green herbage, then conservation of the surplus as silage can proceed almost independently of the weather and in the southern dairying districts this is an important consideration.

Probably the best arrangement on most dairy farms, is to start mowing in the early springtime and make silage until the weather becomes suitable for hay-making when the balance can be conserved as meadow hay.

Both silage and hay-making are methods of preservation and do not transform an inferior product into a good one. For silage, a start can be made as soon as the main pasture plants commence to flower. Mowing at an early stage, when the foliage is leafy and nutritious and before it becomes stemmy and indigestible is important from the point of view of quality in hay.

The practice of pressing meadow hay has become almost general as it offers so many advantages in storage and handling. Because of the deterioration that can occur when hay lies exposed in the paddock, farmers who do not possess their own press would be well advised to hold the loose hay in large cocks or even build a temporary stack until the press arrives.

It is inadvisable to mow the same paddocks regularly each year as this weakens and opens the sward and permits the entry of weeds. Taking away of the produce to another farm or even to another part of the same farm, represents a loss of fertility from the paddock in which the herbage was grown, and care must be exercised to see that this does not occur too frequently or it will lead to serious depletion of soil fertility, and pasture deterioration.

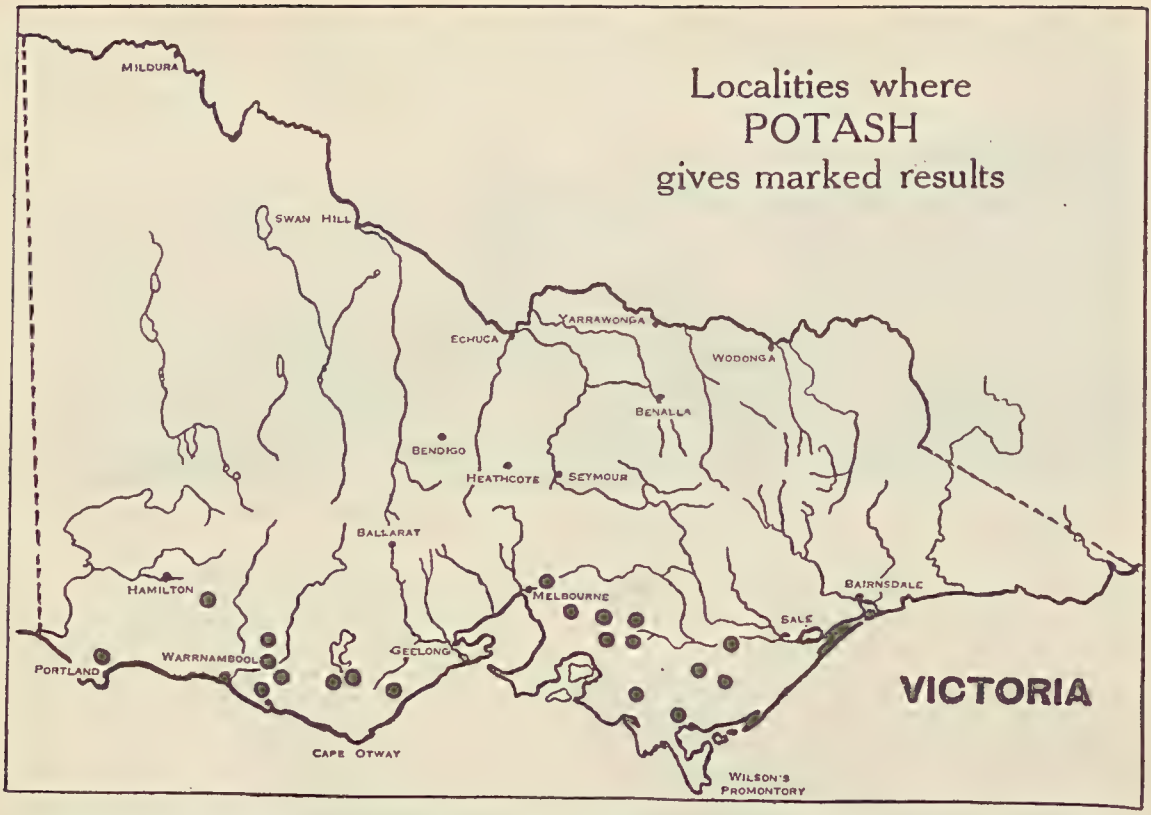
### Conservation of Soil Fertility.

Properly managed, improved pastures are unique as agents for building soil fertility and preventing soil erosion, but if mismanaged they can be the means of impoverishing the soil.

Improvement of soil fertility is achieved by the continuous cycle of growth of herbage, its consumption by stock and the return of excreta and unconsumed herbage to the soil. Such a system continues to build soil fertility at an increasingly faster rate until limited by the amount of plant food and/or moisture available to the plants.

Practically all Victorian soils are naturally short of phosphate and this is a limiting factor in the improvement of soil fertility, but when this element of plant food is provided by top-dressing with superphosphate the cyclic process of building fertility in the soil can proceed fairly rapidly. It will be obvious that if the cycle is interrupted and the animal excreta are not returned, then the system changes from one of building fertility to one of exploiting it.

Under our present methods of live stock husbandry, where milking cows are herded away from the grazing paddock for varying periods during the 24 hours and fodder is harvested from paddocks and fed in other places, soil fertility can decline and there is ample evidence that this is happening




The black dots on the map indicate location of farms where potash has given improved growth on experimental plots. There are numerous other places however in the southern part of the State where signs of potash deficiency are evident, but where no plots are located, and hence are not indicated on the map.

on a number of farms. To counteract this effect, night resting paddocks should be rotated around the farm as much as practicable or used in alternate years for the growing of supplementary fodder crops. Animal excreta deposited at the milking sheds should be collected in a manure pit and returned to the paddocks as liquid manure. By doing these things the amount of artificial fertilizer necessary each year to maintain pastures in a vigorous healthy condition will be considerably lessened, and soil fertility conserved.

## Top Dressing.

The object of top-dressing grassland, is to provide plant food that is either absent or unavailable in the soil and the fertilizer applied should therefore contain the necessary mineral elements in a readily available form. Certain materials such as lime and gypsum are used as soil ameliorants.

Numerous trials have shown that Victorian soils generally, with few exceptions, are very deficient in phosphate and that the shortage is so acute that it ranks first in importance. A deficiency of potash occurs on a number of the lighter soil types in the better rainfall areas, in some instances, to a marked degree.

Although many soils show evidence of a small deficiency of calcium, in only a relatively few areas is there a shortage sufficiently acute to warrant heavy applications of lime. There is evidence of minor element deficiencies in some of the poorer soils but the extent of the country affected is not yet accurately known.

### Phosphate.

Under Victorian conditions, the most economic fertilizer to use for the correction of phosphate and small calcium deficiencies is superphosphate and the quantity to apply depends upon several factors of which rainfall is most important. Under good rainfall conditions, an application of 2 cwt. per acre of "super." annually, appears to be about the upper economic limit at present, but where rainfall is supplemented by irrigation, as much as 4 cwt. per acre can be used with profit. In the 25 to 30 inches rainfall zone,

the optimum quantity to use appears to be somewhere between 1 and 2 cwt. per acre annually.

Trials have shown that on some soils about 60 per cent. of the phosphate applied as "super" is taken up by plants and about 40 per cent. remains as a residuum in the soil in a form slowly available to plants. Because of this reverted phosphate and due to the return of animal and plant residues, the regular application of "super." builds up the phosphate content of the soil. If after a number of years of liberal top-dressing and building up of phosphate reserves the rate of application is reduced, the immediate diminution of growth is not great in the first year, but in subsequent years as the reserves become depleted, the decrease becomes more marked. The plants themselves become the indicators to any farmer who knows his farm as to how much phosphate is needed.

On soils that have not been liberally top-dressed in the past a reduction in the amount of superphosphate applied causes an immediate and substantial decrease in the quantity of herbage in the first season.

While "super." gives the most spectacular response if applied in the early spring, feed is usually abundant at this time of the year and growth produced in the autumn and winter from "super." applied early in the year is the more valuable.

### Potash.

Trials have shown that pastures on soils deficient in potassium and phosphate, respond readily to "super." and muriate of potash, "super." and cement ash or "super." and farmyard manure.

Potassic fertilizer is expensive and on this account cannot be used as liberally as "super.". It seems that the use of about ½ cwt. per acre could be economically justified under existing conditions. There is no evidence to suggest that less "super." is needed because potassic fertilizer is used, but with the additional expenditure on fertilizers it might not be as economic to apply the "super." at its former rate. Where there is more than one major deficiency of plant food in the soil and in consequence more than one

The black dots indicate the regions where lime has given a marked response on pasture plots, but this does not mean that such a result will occur on every farm in these areas, or that other areas deficient in lime will not subsequently be located.

Liquid manure from portable tank being sprayed over the pasture.

fertilizer has to be used, the matter of deciding upon how much of each fertilizer can be applied with profit is rather difficult. The ratio of each to be used will depend upon the deficiency of each that already exists in the soil, and the quantities of each that are leaving the farm in the form of produce. Old world practice might give a useful guide in this matter.

### Lime.

In Victoria, soils having a marked deficiency of calcium are the exception rather than the rule, but there is positive evidence of their occurrence on some of the silurian formations, on most of the red basaltic country of Gippsland and on several sedimentary formations in the coastal areas. The reaction of these soils usually ranges from about pH.5 to pH.5·5 although occasionally the pH. is lower. Marked responses to applications of calcium compounds such as lime or dolomite occur and in their absence, legume development is slow and unsatisfactory and may fail entirely. Inoculation of seed with root nodule bacteria is often beneficial on these soils that respond to lime.

On lime deficient country trials have shown positive responses to all forms of lime used, the burnt lime being sometimes faster in its action than the ground limestone which may show little, if any, effect until a season has passed. Even on soils of high acidity an application of as little as 5 cwt. per acre of agricultural lime usually gives a positive result.

There is little foundation for the statement that is sometimes made that regular and heavy use of "super." makes the soil acidic and that lime is needed as a corrective. Sometimes the reverse is the case, and farmers should not be influenced by propaganda of this nature designed to sell lime because of the shortage of superphosphate. On cultivated land light applications of lime made shortly before sowing often give economic results, whereas heavy applications of lime applied to established pasture give little or no result. Farmers would be well advised to treat small areas on their farms and be guided by results before buying large quantities of lime.

### Farmyard Manure.

While generally the use of particular fertilizers to overcome specific deficiencies in plant food in the soil is sound practice, the amounts needed annually can be kept to a minimum by the conservation and use of farmyard manure. This valuable material contains up to nine tenths of the plant food gathered by the grazing animals or brought on to the farm in the form of supplementary fodder (see table). The beneficial results that follow the use of farmyard manure are lasting and no doubt are due to other things besides the actual mineral plant food it supplies to the soil.

Residual Values of Fodders in Farmyard Manure in Terms of Common Foodstuffs.

| Fodder (1 ton). | Equivalent Residual Values— | | |
|---|---|---|---|
| | Superphosphate (22 per cent.). | Muriate of Potash. | Sulphate Ammonia. |
| | lb. | lb. | lb. |
| Mixed pasture, green, succulent .. .. | 12 | 21 | 40 |
| Pasture hay .. .. | 33 | 54 | 51 |
| Lucerne hay .. .. | 39 | 58 | 108 |
| Oaten hay .. .. | 34 | 38 | 38 |
| Oaten straw .. .. | 14 | 50 | 16 |
| Wheat .. .. | 66 | 21 | 72 |
| Oats .. .. .. | 63 | 19 | 74 |
| Barley .. .. | 66 | 18 | 75 |
| Maize .. .. | 63 | 13 | 75 |
| Bran (2,000 lb.) .. | 192 | 45 | 94 |
| Pollard (2,000 lb.) .. | 177 | 42 | 97 |
| Meat meal (2,000 lb.) .. | 238 | 12 | 387 |
| Linseed meal (2,000 lb.) | 116 | 39 | 194 |
| Separated milk (200 gal.) | 14 | 6 | 24 |
| Whey (200 gal.) .. | 9 | 6 | 5 |

The remainder of this report dealing with pasture trials conducted in the Gippsland, Western, Central and North-eastern Districts, and irrigated pasture trials in the Northern Districts, will appear in a subsequent issue of the Journal.

# Certified Pullorum Tested Flocks

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942, issue of the *Journal of Agriculture*.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

| Owner. | Number of Birds. |
|---|---|
| Abernethy, F. J., Box 108, Horsham | 577 |
| Abikhair, L., 41 Wilfred-road, Ivanhoe | 45 |
| Adams, A. E., Toolleen, via Heathcote | 389 |
| Andrew, C. S., Longlands-road, Mitcham | 128 |
| Armstrong, D. M., Fryers-road, Campbell's Creek | 219 |
| Ashgrove Stud Poultry Farm, Cockatoo | 1,795 |
| Baldwin, J. H., Wattle Glen | 292 |
| Bantick, K., Old Dandenong-road, Heatherton | 411 |
| Barastoc Experimental Farm, Central-avenue, Bayswater | 327 |
| Barlow, M., Everest-crescent, Olinda | 58 |
| Barnes, Mrs. A., The Heights Poultry Farm, Blackburn-road, Blackburn | 2,763 |
| Bartholomew, G., Canterbury-street, St. Arnaud | 144 |
| Bartlett, N. M., Box 5, Pimpinio | 325 |
| Bassett, R. A., South Muckleford | 171 |
| Batey, L. J., Katandra West | 784 |
| Batey, R. V., Katandra North, via Yabba North | 878 |
| Batten, F. H., Central-avenue, Bayswater | 766 |
| Becker, F. W., Follett-road, Cheltenham | 326 |
| Beer, Mrs. E. V., "Rainbow Lodge," Kyneton | 151 |
| Benedikt, A., Old Dandenong-road, Heatherton | 454 |
| Bentley, F. W., P.O. Box 83, Frankston | 1,189 |
| Berry, R., Campbell's Creek | 21 |
| Bilton, H. A., St. Arnaud East | 177 |
| Bingley, A., 333 Highbury-road, Burwood, E.13 | 803 |
| Bode, C. H., Research | 1,040 |
| Bogatin, A., Warren-road, Mordialloc, S.12 | 197 |
| Boyce, A. D., Springvale-road, Forest Hill | 1,000 |
| Bradstreet, J. F., 236 Princes-highway, Dandenong | 470 |
| Bray, J., 18 Hotham-street, Warrnambool | 98 |
| Buchanan, R. O., Diamond Creek | 1,090 |
| Butler, J. E., Nathalia | 660 |
| Cakebread, H., Shady Creek, via Buln Buln | 200 |
| Cannings, P. G., Shepparton East | 1,261 |
| Carlella Poultry Farm, Campbell's-road, Briar Hill | 49 |
| Chapman, Mrs. E. E., Youanmite | 349 |
| Charnley, Harry, South Morang | 62 |
| Christie, R. R., and Son, Bentleigh | 829 |
| Cleeton, R. 2 Myola-street, Carrum | 50 |
| Clegg, R. M., 52 Burns-street, Hamilton | 69 |
| Coats, C. J., Box 34, Donald | 203 |
| Coleman, A. J., Mountain-highway, Bayswater | 50 |
| Colquhoun, Mrs. A. L. D., "Aringa" Ringwood | 26 |
| Corbett, A. B., 2 Banksia-street, Heidelberg | 154 |
| Corbett Bros., Messrs., Torbay-street, Macleod | 1,317 |
| Cornish, J. T., Healseville | 283 |
| Counsell, A. J., Koomba-road, Wantirna | 484 |
| Coupar, J. E., Box 18, Nathalia | 519 |
| Cousins, Mrs. F., 163 Melbourne-road, Dandenong | 46 |
| Cox, F. S., and West, C. P., Messrs., Grange-road, Cheltenham | 202 |
| Crosbie, R., Tempy | 671 |
| Crowle, L. Z., "Monomeith," Broadford | 241 |
| Cumming, H. D., "Jellalabad," Darlington | 51 |
| Davey, A. R., Sellars-street, Greensborough | 626 |
| Davidson, Mrs. A., Sherbrooke-avenue, Ringwood | 107 |
| Davies, L. F., Westall-road, Springvale | 395 |
| Dawson, L. J., "Hill View," Eversley | 1,012 |
| Dawson, R. G., Maldon-road, Castlemaine | 948 |
| Dent, A. T., Sellars-street, Greensborough | 646 |
| Dibbs, H., 3 Balfe-crescent West Brunswick | 145 |
| Dimoline W., and Son, Messrs., Heatherton-road, Noble Park | 450 |
| Dixon, Charles E., Sinclair-road, Bayswater | 807 |
| Dookie Agricultural College, Dookie | 399 |
| Dron, W., Box 202, Horsham | 568 |
| Dyke, Mrs. F., Spring-road, Springvale | 15 |
| Eastaugh, T. L., Point Nepean-road, Highett, S.21 | 616 |
| Elson, H., "Osborne," Mornington | 110 |
| Emmott, J. T., Inglewood | 445 |
| Evans, Geo. R., 10 Mill-street, St. Arnaud | 177 |
| Everard H. L., Hawkesdale | 299 |
| Eyres, L., Main Ridge | 295 |
| Fellows, J., Outhwaite-road, West Heidelberg | 521 |
| Finck, E. W., Heathmere | 184 |
| Fitchett, C. W., Springvale-road, Tally Ho | 1,104 |
| Fletcher, J., Yallamba Poultry Farm, Clarkes-road, Yarrambat | 206 |
| Forbes, Mrs. R., "Bridgehaven," Pental Island, Swan Hill | 141 |
| Francombe, Mrs. M., "Kathwal," Princes Highway, Dandenong | 35 |
| Fugger, E., 1 Myola-street, Carrum | 190 |
| Gair, W. L., Bayswater | 136 |
| Gammie, H. C., Tibrockney-street, Highett | 145 |
| Gedye Bros., Messrs., Blackburn Poultry Farm, Blackburn | 3,245 |
| Gibbs, A. E., "Avonlea," Stanhope | 1,590 |
| Gibbs, J. L., Shepparton | 67 |
| Gilchrist, W. J., Rossiter-road, Koo-wee-rup | 854 |
| Gillespie, C., Britannia Creek-road, Wesburn | 194 |
| Gillespie, Mrs. L., Katamatite P.O. | 203 |
| Giovanetti, Mrs. G. E., Skene-street, Kennington, Bendigo | 185 |
| Godfrey, Mrs. M. A., "The Wattles", Healesville | 168 |
| Gough, L., 6 Clive-street, East Brighton | 173 |
| Graham, C., "All Black Poultry Farm," Portarlington | 58 |
| Grant, D., 6 Laurel-grove, Blackburn | 102 |
| Greenshields, E. J., Lancefield | 669 |
| Greenwood, J., Canterbury-road, Forest Hill | 309 |
| Gregson, Mrs. E., Ky Valley | 266 |
| Grenville, G. W., Grenville Stud Poultry Farm, Springvale | 873 |
| Gwyther, R. P., "Woorayl," Highton, Geelong | 621 |
| Hall, R. H., Wal Wal | 840 |
| Hall, W. S., Carins-road, Hampton Park, via Dandenong | 199 |
| Hamblin, N. A., "Sunny Hill" Poultry Farm, Toolleen | 2,386 |
| Hamilton, A., "Lyncroft," Flinders | 485 |
| Hansen, Mrs. M. A., Katandra West | 88 |
| Hardie, F. A., 25 Grange-road, Sandringham, S.8 | 66 |
| Harrington, W., 179 Woodward-road, Golden Square | 1,005 |
| Harrison Mrs. A. Shenfield-street, Cobden | 151 |
| Hayes, R., Mt. Dandenong-road, Montrose | 183 |
| Haythorne, J., 30 Bailey-avenue, Preston, N.18 | 257 |
| Hearse, G. E., Narre Warren North | 96 |
| Hemphill, A. E., "Glenara" Poultry Farm, Monegetta | 521 |
| Henderson, C. W., Shepparton East | 580 |
| Henderson, Wm. R., 22 Chesterville-road, Cheltenham | 57 |
| Hewett, A. T., Central-avenue, Bayswater | 472 |
| Hewitson and Phelan, Messrs., "Golf House," Healesville | 122 |
| Hewitt's Poultry Farm Skene-street, Bendigo | 806 |
| Hickman, C., 50 Stephen-street, Hamilton | 19 |
| Hill, A. E., Terrara-road, Vermont | 391 |
| Hipwell, Mrs. M. C., Maffra | 391 |
| Hobson, F. L., Oakleigh-road, Lower Ferntree Gully | 20 |
| Holdsworth, A. W., "Trevallyn," Jung | 809 |
| Hollingshead, R. F., "Quarrydene," Montrose | 810 |
| Hollis, C., Donald | 209 |
| Holt, R. A., Jindivick | 345 |
| Hopkins, C. A., 13 Knight-street, Shepparton | 812 |
| Howard, A. P., Blackhill-road, Kyneton | 306 |
| Huckle, W. H., Waverley-road, Glen Waverley | 174 |
| Hughes, Mrs. M. E., Mountain-highway, Bayswater | 124 |
| Humphrey, A. J., 355 Highbury-road, Burwood | 253 |
| Hunt, R. R., 365 Highbury-road, Burwood, E.13 | 1,008 |
| Hurst, H., Eltham Hatchery, Eltham | 1,089 |
| Ikin, E. J., 44 Mackay-street, Seddon, W.13 | 64 |
| Iredale, W. H., 197 Point Nepean-road, Seaford | 37 |
| Jackson, Miss E. M., 4 Monash-street, Box Hill, E.11 | 31 |
| Jacobsen, W. R., "Sutton Park," Hull-road, Croydon | 82 |
| Jenkins, A. E., "Pen-Y-Bryn," Ridge-road, Kallista | 320 |
| Johnson, A., Burwood-road, Ferntree Gully | 2,363 |
| Jolly, W., c/o Five Ways P.O., via Cranbourne | 252 |
| Jones, M. A., Heatherdale-road, Ringwood | 401 |
| Kell, A. W., 6 Mill-street, St. Arnaud | 133 |
| Kemp, H. L., "Glenmayon," Whitehorse-road, East Ringwood | 93 |
| Kennedy, W. R., Hampton Park, via Dandenong | 200 |
| Kerr, J. J., Clarke-road, Springvale | 922 |
| Kidgell, L. L., 34 Mullum-road, Ringwood | 336 |
| Kolonis, V., 49 Major-road, Fawkner, N.15 | 368 |

## Certified Pullorum Tested Flocks—*continued.*

| Owner. | Number of Birds. |
|---|---|
| Kosch, E. W., Coromby | 417 |
| Lang, J., 46 Dundas-street, Thornbury | 54 |
| Lawrie, Mrs. M.J., 107 Albert-street, Sebastopol, Ballarat | 430 |
| Le Deux., F. J., Angustown, via Nagamble | 244 |
| Liddle, Mrs. A. E., "Parkview," Cranbourne-road, Frankston | 109 |
| Longerenong Agricultural College, Dooen | 448 |
| Love, F. J., Clarke-road, Springvale | 561 |
| Lowe, G., Blackwood Dell, Lillico | 92 |
| Lowe, L. S., "Callenmondah," Central-avenue, Bayswater | 418 |
| Lucas, G., 4 Downing-street, Blackburn | 1,105 |
| Mackintosh, Walter C., Neerim South | 508 |
| MacLean, C. C., Kelvinside-road, Noble Park | 69 |
| McCabe, R., Gladstone-road, Dandenong | 1,712 |
| McCausland, W., Boronia-road, Boronia | 48 |
| McConnell, Messrs. L. W., and A. M., Glenormiston South | 733 |
| McDonald and Ellen, Avoca | 640 |
| McDonald, J., 43 Bloomfield-avenue, Maribyrnong | 164 |
| McDonald, J. L., Lyons-road, Croydon North | 149 |
| McDonald, R. A., "Barton," Moyston | 189 |
| McKinnon, Mrs. M. L., Yielima, via Nathalia | 774 |
| McLaughlin, K. A., Dandevue P.F., Central-avenue, Bayswater | 709 |
| McLean, J. F., Follett-road, Cheltenham | 293 |
| McNamara, O. J., 24 Sherbrooke-avenue, Ringwood | 474 |
| McNell, W. G., Hillcrest-avenue, Eltham | 364 |
| Maher, Allan E., "Alandale," Wal Wal | 970 |
| Major, Chas. D., Dudley-street, Rochester | 391 |
| Major, W. R., Girgarre | 221 |
| Mayne, N., Brandy Creek-road, Warragul | 89 |
| Mead, J. L., 28 Golf Links-avenue, Oakleigh | 186 |
| Meaklim, R., Drumnell Park, Mooroopna | 80 |
| Meier, C. G., "Bylands," Sydney-road, Kilmore | 300 |
| Messenger, C., 240 Rathmines-street, Fairfield | 180 |
| Miceli, M., Monbulk Post Office | 120 |
| Michell, R., Greensborough-road, McLeod | 576 |
| Mills, J. E., 202 Collins-street, Thornbury | 260 |
| Moller, F. C., Warburton-road, Lilydale | 84 |
| Molson, W. E., 188 Surrey-road, North Blackburn | 727 |
| Mooney, D., Yarra Junction | 260 |
| Moore, H. A., Warrandyte-road, Ringwood North | 900 |
| Morgan, P. D., Willaura, via Ararat | 160 |
| Moroney, J. B., High-street, Kangaroo Flat | 1,808 |
| Muir, J. S., Wantirna-road, Ringwood | 392 |
| Mulconry, H., 2 Callender-road, Noble Park | 147 |
| Mumford, L. J., Steele-street, Healesville | 400 |
| Muntz, E. W., Ballarat Boys Grammar School, Ballarat | 7 |
| Nankervis, H. A., Lilydale | 508 |
| Nemet, P., Springvale-road, Springvale South | 1,295 |
| Nettlebeck, C. S., "Edenhope," Westall-road, Springvale | 594 |
| Nichols, Mrs. E. M., "All Red" Poultry Farm, Yan Yean | 732 |
| Orange, Mrs. C., "Lakewood," Marong | 234 |
| O'Shea, J. M., Avoca | 94 |
| Overman, C. J., 24 Vernal-avenue, Mitcham | 800 |
| Paton, W. S., Rokeby Farm, Glenburnei-road, Mitcham | 114 |
| Peel, C. W., "Callemondah," Gnarwarre | 261 |
| Petrie, R. W., Box 25, St. Arnaud | 181 |
| Phillips, C., Barry-street, Seaford | 151 |
| Pobjoy, J., Patterson-road, Springvale South | 761 |
| Poole, A., Hull-road, Mooroolbark | 321 |
| Pooley, F., Canterbury-road, Blackburn | 241 |
| Porter, J., Sherbourne-road, Montmorency | 284 |
| Poulton, A. W., Vickers-street, Sebastopol | 1,537 |
| Power, J. M., Ferntree Gully-road, Notting Hill | 188 |
| Purser, E. T., Everard-road, Ringwood East | 849 |
| Rae, J., 277 Albert-street, Sebastopol, Ballarat | 2,272 |
| Ralph, W. R., Commercial-road, Lower Ferntree Gully | 107 |
| Reid, J. D., Dandenong | 40 |
| Ridge and Son, Messrs., 42 Myrtle-grove, Blackbrun | 893 |
| Ridgway, Geo., Callander-road, Noble Park | 196 |
| Ritchie Bros., 46 Laurie-street, Ballarat | 5,954 |
| Robinson, J. L., Langwarrin | 167 |
| Robson, F., 16 Nelson-street, North Wonthaggi | 25 |
| Rogers, C., Panton Hill | 102 |
| Rogers, S., James-street, Dandenong | 1,244 |
| Rouse, H. E., James-street, Box Hill | 86 |
| Rowe, Messrs., D. and L., "The Wattles," Wal Wal | 239 |
| Ruschmeyer, F., Woodward-road, Golden Square | 436 |
| Rushton, J. A., 11 Barker-avenue, Shepparton | 634 |
| Salmond, J. B., Deer Park | 153 |
| Sanders, A., Stud-road, Wantirna | 299 |
| San Miguel, Mrs. M. H., Woodhouse-grove, Box Hill | 2,361 |
| Scales, J., West Wattletree-road, Boronia | 1,048 |
| Schulze, Mrs. C. A., Box 52, Dimboola | 98 |
| Scouller, R. C., Tarrant-street, Cobden | 316 |
| Seear, W. T., Station-road, Wesburn | 89 |
| Shaw, F. T., 42 Murray-street, West Brunswick, N.12 | 93 |
| Shelford, D., Beaufort-road, Croydon | 141 |
| Shipp, R., P. B., Kerang | 511 |
| Simmons, J. T., 6 Lindsay-avenue, Murrumbeena, S.E.9 | 24 |
| Simpson, G. D., Greenways Poultry Farm, May-road, Glen Waverley | 2,772 |
| Smith and Edwards, 61 McPherson-street, Horsham | 34 |
| Smith, E., Valley-road, Highton, Geelong | 1,285 |
| Smith F., 39 Speight-street, Thornbury | 58 |
| Smith, H. A., Marong-road, Maiden Gully | 374 |
| Spry, W. P., "Esswill," Culgoa | 463 |
| Stant, W. J. and F. E., Westall-road, Springvale | 1,505 |
| State Research Farm, Werribee | 407 |
| Steinmann, A., Creswick | 38 |
| Stephenson, C. C., Beard-road, Research | 402 |
| Stephenson, W. B., "White Hills," Creswick | 66 |
| Stewart, J. A., Maldon-road, Castlemaine | 770 |
| Stewart, P. D., Bayswater-road, Croydon | 98 |
| Stiles Bros., "Fair View," Wallan | 1,091 |
| Stoneman, J. W., "Carlella," Campbell's-road, Briar Hill | 49 |
| Streeter H. A., Avoca | 281 |
| Streeter, Wm., "Riverdale Poultry Farm," High-street, Avoca | 282 |
| Stribbles, R., Pipers Creek, via Kyneton | 195 |
| Sullivan, T., Biggs-road, Coburg, N.14 | 290 |
| Sutherland, J. M., Fulton-road, Box Hill | 927 |
| Sweeney, J. J., Tarara Stud Poultry Farm, Ararat | 788 |
| Swift, D. A., Kangaroo Flat | 853 |
| Taylor, H. R., 119 Rathgown-road, Reservoir, N.19 | 248 |
| Throup, N. C., Neerim South | 149 |
| Throup, R. E., Neerim South | 328 |
| Travaglia Bros., Canterbury-street, St. Arnaud | 883 |
| Trinca, M., Valley-street, East Oakleigh | 1,198 |
| Triplett, C. A., Muskerry, via Goornong | 280 |
| Turner, R. W., Donna Buang-road, Warburton | 147 |
| Uren, B. W., Taroona Farm, Lawrence-road, Mt. Waverley | 571 |
| Waldmann, F., Greythorne-road, North Balwyn | 936 |
| Walton, F. R., Woodvale-road, Boronia | 83 |
| Wanliss, W. J., Springvale-road, Springvale South | 969 |
| Wardlaw, A. E., Avoca | 128 |
| Waugh, A. J., Helms-road, Kangaroo Flat | 970 |
| Webb, A. E. H., Frankston-road, Cranbourne | 3,854 |
| Welch, T. A., Cr. Bayswater-road and Central-avenue, Bayswater | 973 |
| Wernli, J. H., Alpine Poultry Farm, Wilson-street, Cheltenham | 1,061 |
| Wesley, J. H., Jnr., "Fairview," Kangaroo Flat | 846 |
| Weston, W. J., 104 Broom-crescent, Wonthaggi | 33 |
| Wheeler, F. R., Ararat | 71 |
| White Bros., Stuart-road, Clarinda | 243 |
| Whitham, R. S., 28 Neville-street, Glen Huntly | 113 |
| Whitington, S., 797 Bell-street, Preston | 93 |
| Williams, V. H., 91 Tone-road, Wangaratta | 708 |
| Winter, G., "Denehurst," Murgheboluc | 297 |
| Wohlers, S., Box 17, Jung | 314 |
| Wooster, G., Yallambie-road, Watsonia | 237 |
| Wright, A., Conpugna Township, via Tallygaroopna | 464 |
| Wyld, Miss M. L., Regent-street, West Moolap via Geelong | 43 |
| Yates, W., 64 Banks-street east, Ascot Vale | 30 |
| Youl, R. S., "Wycherley," Wedderburn | 1,254 |

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# ASSOCIATION HERD TEST

## Annual Report, 1944-45

By W. J. YUILL, Supervisor of Herd Testing

A threefold increase in the number of cows recorded in the Association Herd Test during the past two years is remarkable in view of the devastating drought conditions that have prevailed over the major portion of the State during that period. In addition to the drought there have been other influences which might have been expected to retard further development, namely a difficulty in securing and retaining suitable herd-testers and in obtaining the necessary transport for them. Inability to replace a tester or to obtain one until after the season had commenced, considerably affected records in some areas, while the need to ration irrigation water and the drying up of water storages, springs, and streams all contributed to an increase in the difficulties of carrying on the work.

Messrs. Taylor & Weise's leading herd in the "20 to 40 Cows" Section, with an average of 415 lb. butterfat.

Few herd-owners were prepared for a two-year drought. Even where fodder conservation was the usual practice on a farm, manpower difficulties frequently resulted in reduced quantities of fodder being conserved. Added to this shortage of home-grown fodder was the difficulty experienced in purchasing hay or concentrates of any kind. In well-favoured, high-rainfall districts, and on irrigation farms, the reduced quantities of fertilizer available diminished the carrying capacity of most farms. The cumulative effect of these factors is well reflected in the 218-lb. butterfat average of the 53,015 cows included in this report, compared with the 261-lb. butterfat yield of nearly 85,000 cows in 1939.

Mr. D. Fehring's herd of 25 cows in the Rochester Association averaged 405 lb. butterfat.

Some herd testing difficulties which occurred during the war period have now been solved. Babcock Test Centrifuges are being manufactured in Melbourne; while the necessary glassware

and tinware are also being made in Australia. The transport problem that sometimes prevented a tester from taking a position, is also improving as cars and trucks are released, while horsedrawn floats are procurable in some districts.

The greatest problem in the Association Herd Test however, is to obtain enough suitable herd-testers. Numerous members of the Australian Women's Land Army who signed on for the duration of the war are now asking to be released, a number have married, while others await the return of their menfolk, when they too will be seeking release. The addition of nearly 60 re-organized or entirely new units, and the insufficient number of testers, have imposed a severe strain on the herd recording staff of the Department of Agriculture. Owing to the breakdown of pre-war training facilities, the work of training testers was taken over by the Herd Test Branch of the Department of Agriculture, which has given a considerable part of its time to the work since September, 1943. During this time seven classes have been held at Burnley and 123 persons have obtained certificates permitting them to carry out herd testing work. Despite the higher payment now made to herd-testers however, it is difficult to secure men for the work.

Last year the herd average in the Association Test was close to 40 cows, whereas from 1930 to 1932 inclusive, the average was under 30. Where the herds exceed 50 cows, four complete runs of the centrifuge are needed, each occupying almost one hour of the tester's time. There were 355 such herds in last year's test, nearly 100 being over 70 cows. If some help can be afforded the tester for a couple of hours while the testing is proceeding, the work can be greatly "speeded up", and much time gained, for the slow work of pipetting a second set of tests can be carried out while the helper is centrifuging the first set of samples. Every effort should be made to allow the tester to get on with the actual testing as soon as possible after the completion of the morning milking. As the tester is responsible for tattooing all female calves, these should be tied up nearby ready for the job to be done. The necessary details of each tested cow and calf for the official register also should be readily available.

### *The Association Register*

In past times, herd-testers have used a variety of systems for registering the breeding and identification of herd-test animals. Frequently the details were placed on the record card by the tester, who returned the card to the owner at the end of the lactation and these cards were often mislaid. The books in which the tester made his records were his own property and consequently were not always left behind when the tester left the district, and the new tester quite frequently had to

Mr. J. Bullingham's Friesian herd of 39 cows in the Tongala Association, averaged 412 lb. butterfat, and occupies second place in the "20 to 40 Cows" Section.

obtain the relevant data when the next Annual Report was being prepared. Some Association members have excellent registers of their own, and give every assistance to a new tester; but others make no such effort, and, at times, actually hinder the procuring of the necessary data. Because of these unsatisfactory conditions, the Department of Agriculture has undertaken to provide each unit of an Association with a strongly-bound Official Register, which shall be filled in by the tester, once for each cow and heifer calf. This register shall be the property of the Association, and it shall be the Secretary's responsibility to see that it is kept up to date. The Superintendent of Dairying may instruct the District Dairy Supervisor to inspect the register from time to time if he considers it necessary to do so.

Mr. H. Tomlinson's Grade Jersey "Nigger," which filled second place in the "Twenty leading cows" Section with a yield of 703 lb. butterfat.

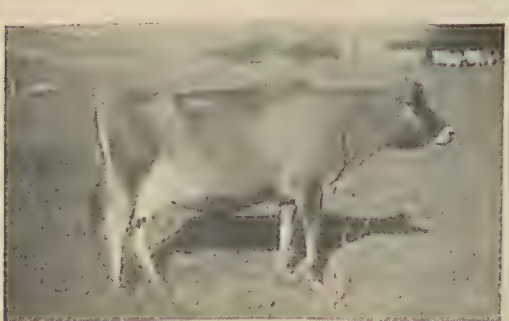
### *Sire Survey Work*

To breed and maintain a herd, that will average around the 300-lb. butterfat level, is the objective of thousands of breeders and farmers. Many have fallen far below this level, after having once attained it.

Investigations often reveal the remarkable variability of the inheritance of dairy sires, as much as 100-lb. butterfat difference being noted, in the average yield of the daughters of two sires. Such differences are frequently due to the bull and it has now become generally accepted, that the sire plays a most important part in herd-building.

A sire survey will definitely indicate the trend of the sire's influence on the herd, but whether the average yield of his daughters shall be the basis of the survey, or whether their yields shall be compared with those of their dams, is not at first as important as the need of a scheme of individualizing identification for all the mates and daughters of a sire. This is the basic thought behind all work of the various breed societies, and it is now possible for all members of a Herd Test Association to so identify their stock by the new scheme of tattooing of all heifer calves, and their dams. The Association Herd Register was designed to supply this service.

Sire surveys are bound to become an important feature of the industry. This work is being developed extensively in the leading dairy countries of the world. However, it can be introduced only where there is herd test data, and where a sound scheme of identification has been established.



"Glenhope Tiddlewinks 9th" owned by Mr. J. B. Fuller in the Dumbalk North Association. This cow produced 550 lb. butterfat with a 7·19 test.

HERDS OF LESS THAN 20 COWS.

| Owner. | Association. | Cows. | Butterfat. |
|---|---|---|---|
| | | | lb. |
| F. P. Maclean .. | Pakenham .. | 11 | 452 |
| L. H. Hust .. | Merrigum .. | 15 | 436 |
| C. R. Shrugg .. | Fish Creek .. | 11 | 399 |
| H. A. Burgman .. | Katandra .. | 18 | 382 |
| H. S. Woodman | Rochester .. | 17 | 371 |
| Mrs. E. McKenzie | Kerang .. | 11 | 368 |
| F. Falford .. | Bairnsdale .. | 17 | 363 |
| F. G. Williams .. | Tongala .. | 11 | 363 |
| A. Quigley .. | Yinnar .. | 10 | 358 |

## *The Year's Work*

Owing to the serious drought conditions through which the State has passed, no analysis of the Annual Report will be attempted. Attention will, however, be paid to some unusual performances among the herds and individual cows. Suffice to say that the coastal areas of Gippsland and the Western district showed a small margin of improvement over the previous year, while the Goulburn Valley and the North-eastern sections showed a serious decline in yield, the average being nearly 40 lb. per cow lower in the lastmentioned area.

The excellent average yield of 281 lb. butterfat from 1,104 cows gains for Cohuna the premier position among all units. There are splendid yields recorded for several large herds, including that of Mr. W. Hornsby, whose 44 cows head the "40 to 60 cow" section with the high average yield of 419 lb. butterfat. Dumbalk North leads all Gippsland units, with a 275-lb. butterfat average for 1,087 cows. Herd depreciation is obviously low in this area, for only 19 per cent. of "first calvers" were tested. The leading six positions in this unit are filled by dairy farmers who have been testing for upwards of 20 years. Their herds exceeded the 300-lb. butterfat level and include those of Mr. R. Trease and Mr. J. B. Fuller—who occupy the leading places on the "60 to 80 cow" list. Each is a foundation member of the unit, which began operations in 1922.

HERDS OF 20 TO 40 COWS.

| Owner. | Association. | Cows. | Butterfat. |
|---|---|---|---|
| | | | lb. |
| Taylor and Weise | Rochester .. | 23 | 415 |
| J. S. Bullingham | Tongala .. | 39 | 412 |
| W. H. Hollyoak | Leongatha .. | 36 | 412 |
| D. Fehring .. | Rochester .. | 25 | 405 |
| A. E. Tack .. | Korumburra .. | 28 | 403 |
| M. Bayliss .. | Calivil–Dingee | 22 | 398 |
| K. and H. McLean | Leongatha .. | 36 | 396 |
| L. Bunn .. | Korumburra No. 1 | 35 | 391 |
| W. Harris .. | Dumbalk North | 40 | 389 |
| Mrs. D. A. Findlay | Leongatha No. 2 | 28 | 387 |
| F. Dinneen .. | Toora – Welshpool | 28 | 382 |
| J. Newton .. | Stanhope .. | 36 | 380 |
| R. Cox .. .. | Swan Hill .. | 25 | 378 |
| E. J. Bingham .. | Mountain View | 33 | 378 |
| O. Jones .. | Dumbalk North | 27 | 372 |
| T. Gaw .. | Bass.. .. | 38 | 370 |
| P. Byrne .. | Narracan No. 2 | 20 | 369 |
| P. Ham and Oliver | Rochester .. | 34 | 368 |
| J. Barrow .. | Korumburra No. 3 | 33 | 362 |
| R. Cox .. .. | Swan Hill .. | 25 | 360 |
| W. R. Orr .. | Stanhope .. | 29 | 357 |
| A. E. Hickey .. | Korumburra No. 3 | 32 | 357 |
| F. F. Humbert .. | Calivil–Dingee | 22 | 357 |
| Harrison Brothers | Korumburra No. 2 | 38 | 353 |
| C. L. Winchcomb | Rochester .. | 37 | 352 |

Gellibrand Valley leads the Western area with an average of 269 lb. butterfat for 1,160 cows, an honour shared with Stanhope in the Goulburn Valley district where the 863 cows tested also produced an average yield of 269 lb. butterfat. Korumburra No. 1 and Leongatha No. 2, each averaged 267 lb., while Tongala, Loch, Rochester, and Korumburra No. 2 all exceeded the 260 lb. butterfat level.

Mr. D. Fehring's "Heather" has exceeded the 600 lb. butterfat level in the past two seasons. On this occasion she produced 610 lb. butterfat.

## *Some Outstanding Herds*

In all, 180 herds exceeded the 300-lb. butterfat level. Of this number, 45 averaged over 350 lb., while nine produced above the high level of 400 lb. If the point be conceded that high herd averages are increasingly more difficult to obtain as

"Cissie," Grade Friesian owned by Mr. J. Bullingham, Tongala, produced 557 lb. butterfat.

the herd increases in size, attention will be focused on the splendid average yield of 313 lb. butterfat for 100 cows in Messrs. Batten and Sons herd; and the 319 lb. average of Mr. J. A. McKinnon's 85 cows. Both herds are tested by the Warrnambool Association. At Gellibrand Valley Mr. C. C. Larsen's 117 cows had the fine average yield of 287 lb. The leading three herds in the "60 to 80 cow" group all have over 300 lb. average yields; while no fewer than fourteen of the "40 to 60 cow" herds exceeded the 300 lb. level.

Mr. Hornsby's herd average of 419-lb. butterfat is built up by an even average herd, rather than by a few high yielding individuals. Second position is filled by Mr. T. G. Farrant of the same association, his 46 cows having the good figures of 371 lb. butterfat.

HERDS OF 41 TO 60 COWS.

| Owner. | Association. | Cows. | Butterfat. |
|---|---|---|---|
| | | | lb. |
| W. Hornsby .. | Cohuna .. | 44 | 419 |
| T. G. Farrant .. | Cohuna .. | 46 | 371 |
| H. Dowell .. | Korumburra .. | 58 | 361 |
| G. White .. | Boolarra .. | 48 | 356 |
| V. Harvey .. | Pakenham .. | 41 | 354 |
| A. Walker .. | Yinnar .. | 41 | 350 |
| J. G. Howell .. | Leongatha .. | 54 | 347 |
| J. W. Wallace .. | Warrnambool.. | 57 | 345 |
| Mrs. Park .. | Tallangatta .. | 51 | 341 |
| A. Schmidt .. | Foster .. | 44 | 334 |
| D. and G. Dodd | Dumbalk North | 51 | 327 |
| A. L. Ross .. | Stony Creek .. | 41 | 318 |
| L. K. Brown .. | Cobden .. | 43 | 316 |
| W. Espie .. | Yinnar .. | 54 | 302 |
| H. Walker .. | Myrtleford No. 2 | 60 | 287 |

With the exception of Mrs. Park of Tallangatta (51 cows, 341 lb. butterfat), and Mr. H. Walker of Myrtleford (60 cows, 287 lb. butterfat), all the remaining herds are in coastal areas. In view of the extraordinarily bad season in the North-east, the yields of the two herds referred to, have an unusual significance.

As usual, the section "20 to 40 cows", has produced some excellent average yields. Five of the over 400-lb. herds are included. Messrs. Taylor and Weise's leading herd for the year in this section has many times exceeded the 400-lb. level, but on this occasion it leads with the largest number of cows so far entered. An interesting feature is that the farm area is only 22 acres in extent. The cows are fed some concentrates, and are rugged in wet weather, and on cold nights.

Messrs. Bullingham and Hollyoak whose herds number 39 and 36 respectively, each have the same butterfat average. The former operates at Tongala, where "Hope Farm" is now well-known for its excellent pastures and farm management; while Mr. Hollyoak lives at Leongatha in South Gippsland.

HERDS OF 61 TO 80 COWS.

| Owner. | Association. | Cows. | Butterfat. |
|---|---|---|---|
| | | | lb. |
| R. H. Trease .. | Dumbalk North | 67 | 352 |
| J. B. Fuller .. | Dumbalk North | 62 | 329 |
| F. J. Olden .. | Korumburra .. | 68 | 305 |
| E. A. Thompson | Kerang .. | 76 | 291 |
| C. V. Ludeman .. | South Ecklin | 62 | 287 |
| Truscott Brothers | Toora – Welshpool | 76 | 285 |
| C. W. York .. | Dumbalk North | 76 | 279 |
| T. Ley .. .. | Eskdale .. | 63 | 265 |

"Charm", a member of Mr. R. H. Trease's leading herd in the "61 to 80 Cows" Section. This cow produced 607 lb. butterfat.

One of the "best twenty cows," the Grade Jersey "Girlie," owned by Messrs. Taylor and Weise. "Girlie" yielded 628 lb. butterfat.

When normal seasons return and ample supplies of concentrates, fertilizer, and water for irrigation are available, there will be a better story to tell, for even the listed herds have not all received the feeding that their owners would desire.

### *The One-ton Butterfat Register*

Since the introduction of the "One-ton" butterfat register by the Department of Agriculture, 140 certificates have been issued in respect of cows that have yielded at least 2,240 lb. butterfat, and are still alive and identifiable. Messrs. H. Batten and Sons of Warrnambool have bred at least 30 such cows, a truly remarkable group of animals, and each of which have exhibited longevity, fertility, and inheritance for continued high production over many years. The outstanding performer to date is "Dusky 2nd" a Jersey grade cow owned by Mr. H. Keele of the Rochester Association. Her aggregate yield is 6,314 lb. butterfat.

Mr. D. Fehring who led the "20 to 40 cow" section last year with a 430-lb. average yield relies entirely on lucerne and meadow hay, to supplement his excellent pastures and lucerne stands. The herd has been increased to 25 cows, but the 400-lb. level is still maintained.

The herd of Mr. A. E. Tack of Korumburra, has risen from tenth to fifth position. Last year Mr. Tack's 29 cows averaged 366 lb. butterfat, while his 28 cows on this occasion, exceeded the 400-lb. level. To raise the herd yield by 40 lb. per head, is a sure sign of excellent management. The largest herd in this section is owned by Mr. W. Harris, whose 27 cows in 1924 averaged 171 lb. of butterfat. The 389-lb. average of Mr. Harris's 40 cows on this occasion is therefore a remarkable achievement.

The highest record for the year goes to Mr. P. Maclean of Pakenham. The 452 lb. butterfat average of his eleven-cow herd reflects credit alike on the present owner and the breeder who is a pioneer member of the same Association. Mr. C. R. Shrugg of Fish Creek has a similar-sized herd that just fell short of the 400 lb. mark. An entirely new owner, Mr. L. H. Hust, from the recently formed Merrigum Association, occupies second place with 436 lb. butterfat average for his fifteen head. Mr. H. S. Woodman of Rochester is fifth, his seventeen cows having the good average of 371 lb. butterfat.

Herds of Over 80 Cows.

| Owner. | Association. | Cows. | Butterfat. |
|---|---|---|---|
| | | | lb. |
| Batten and Son .. | Warrnambool No. 2 | 100 | 313 |
| J. A. McKinnon | Warrnambool No. 1 | 85 | 319 |
| M. Axford .. | Camperdown .. | 83 | 288 |
| C. C. Larsen .. | Gellibrand Valley | 117 | 287 |
| W. A. Gaul .. | Gainsborough.. | 88 | 283 |
| C. Ronald, No. 2 | Traralgon .. | 62 | 277 |
| R. G. Matheson .. | Warrnambool No. 2 | 70 | 263 |

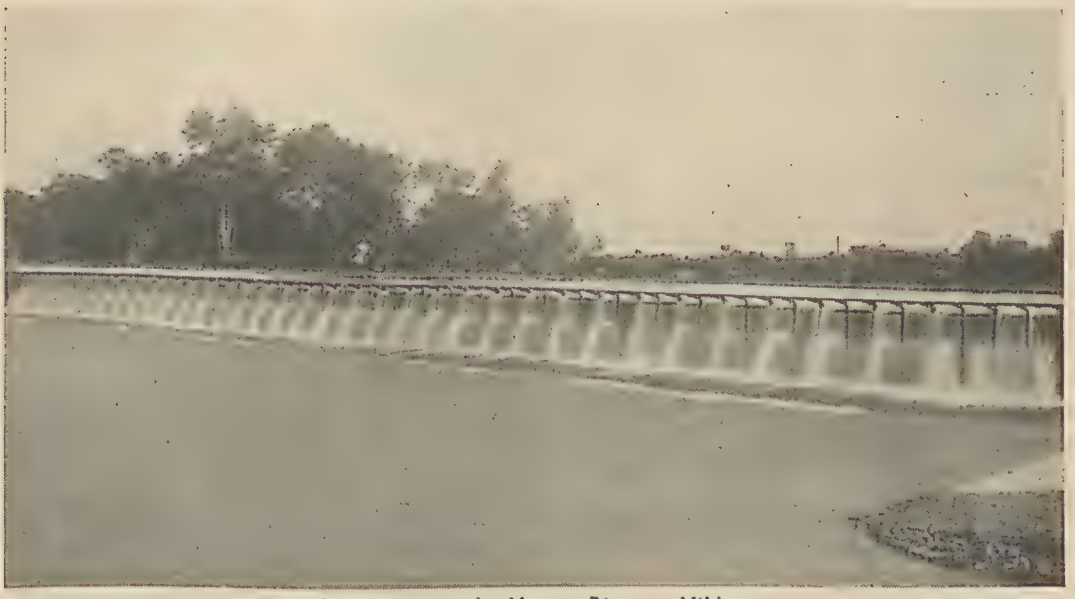
### *The Best Twenty Cows*

There have been some really great cows among the "grades", just as there have been among the registered stock. In 1944, the leading cow was Mr. Tomlinson's grade Jersey "Nigger". On this occasion this cow takes second place to Mrs. D. Findlay's registered Jersey "Glenloth Marina", whose 725 lb. yield follows one of 631 lb. in the previous report, where she was placed in third position. Two other cows from Mrs. Findlay's herd appear on this year's list—

[*Continued on page 522*

# Irrigation of Citrus in the Lower Murray Valley

By FRANK M. READ, M.Agr.Sc.,
Chief Inspector of Horticulture.



The Weir on the Murray River at Mildura.

THE growing of citrus under irrigation has proved one of the most difficult agricultural ventures in Australia. For this several reasons may be advanced. In the first place, the citrus tree is a delicate plant and one of the least tolerant of unfavourable growing conditions. Secondly, most of the soil types we have used in the past have been relatively unsuited to citrus because of high salt, high alkalinity or poor natural drainage properties; and thirdly, citrus has rarely been the main crop in our irrigated settlements. The irrigation methods used, and more particularly the roster of waterings have usually been determined by the needs of, say, the much more widely planted vine. This has not made things easier for citrus growers, although irrigation authorities have co-operated in doing what they can under such conditions.

The first difficulty, the tenderness of the citrus plant we cannot overcome. Though the choice of the most suitable rootstock may assist to a great extent, the writer does not believe that any rootstock will enable citrus trees to be successfully grown except on soil types now known to be reasonably suitable.

The second problem, that of soil type, we shall be wise to avoid in future by planting only on land which our practical experience has shown to be suitable, and the now nearly complete series of soil surveys has enabled us to identify and locate.

The third problem, that of irrigation method, we shall have to face up to, as it will always remain a day to day problem of the individual irrigator. He will get some help from the experience of his neighbours and the experiments of investigators; he will, doubtless, get more and more help if he wants it from Advisory Officers of Agricultural Departments, for the expansion of such services must now go on if we are to benefit as we should from the investigational work already done and

Irrigation of citrus groves on sandy soils is often faulty. In this grove, for example, four furrows would be preferable to three, and they should be only half this length.

now being planned; but in the final analysis, he will always have to rely on himself.

It would be undesirable to attempt in this article to advise irrigators on those things which could only be discussed on their blocks, and could only be checked while an irrigation is in progress. There are, however, simple fundamental facts about irrigation which can be profitably discussed.

### *What Happens in the Downward Penetration of Irrigation Water into the Soil?*

In the first stage during the actual irrigation the upper layers of soil are water-logged, all the pore space between the particles of soil being filled.

In the second stage after natural drainage of the soil has ceased—say one day after irrigation — the soil has been wetted to its *field capacity*. Surplus water between the soil particles has fallen to lower layers leaving a thick film of water around each particle. Beyond this thickness the film cannot be held and the surplus water sinks lower to create a similar film on lower particles. Ultimately all the water applied is held in the layers which can be wetted in this way to the *field capacity*.

If, in the downward movement, however, an impervious clay layer is encountered, free water above the field capacity will be held—i.e., a water table will occur. Thus the amount of water which can *usefully* be held in the root zone is that required to wet it to its field capacity. Any more will at best be wasted, and where an impervious sub-soil occurs, as it so often does in the Murray Valley soils, will create trouble. It will tend to waterlog lower layers, restrict the growth of roots, and cause undesirable soil changes.

The field capacity of a sandy soil is low because it consists of particles relatively few in number and large in size. That of a clay soil is high because it has a much greater number of small particles and thus a greater surface area to hold this wetting film of water.

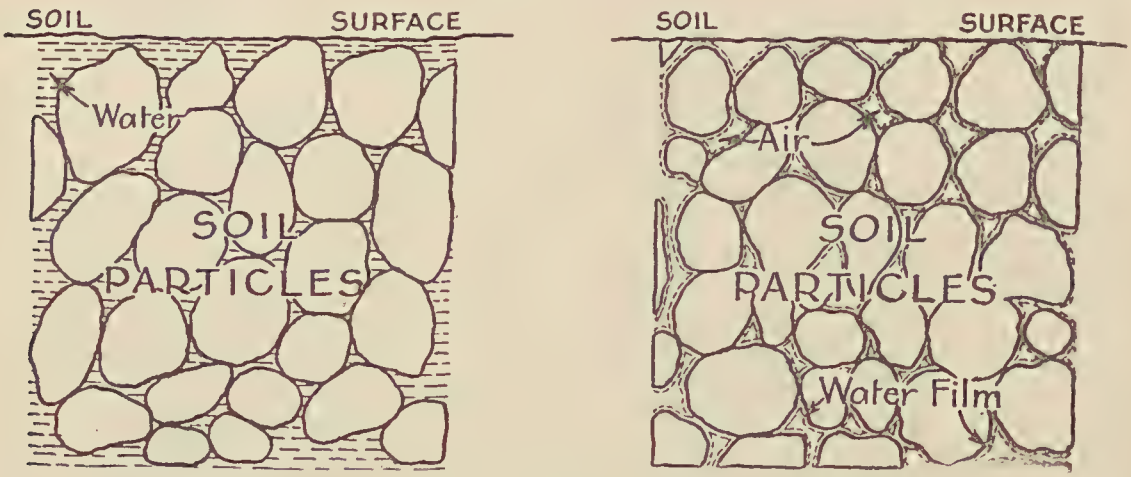



Fig. 1—Left: In the first stage of irrigation the upper layers of soil are water-logged, all spaces between soil particles being filled with water. Right: The soil particles covered with a film of water after natural drainage has ceased, air spaces again appearing between the soil particles.

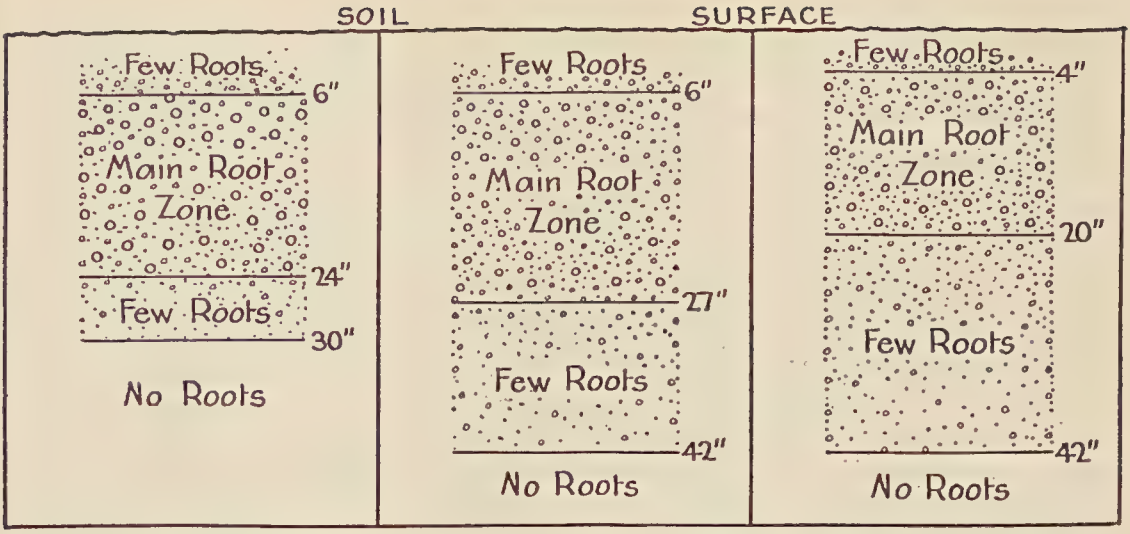



Fig. 2—Left : Washington navel on Sweet Orange stock. Centre : Washington navel on Sour Orange stock. Right : Washington navel on Citronelle stock.

### *What Happens when such an Irrigated Soil Starts to Dry?*

When the soil of a citrus grove has been wetted in this way, it then starts to lose moisture. The top 8 to 9 inches or thereabouts dries out by evaporation assisted by the roots which are in this zone.

The soil below this dries out more slowly and almost entirely as a result of root absorption. Where the roots are more numerous it dries out more rapidly.

The roots, however, can only reduce this film of water on the soil particles to a certain thickness and then the tree wilts—not just for an hour or so at midday, recovering turgidity of its leaves at night, but permanently, i.e., it remains wilted even though the air is cool and moist. This is the *wilting point.* The *wilting point* of a sandy soil is lower than for a loam—the sand being able to give up to the tree relatively more of its water, though its *field capacity* is lower. The following approximate example illustrates this point, the moisture represented by the difference between *field capacity* and *wilting point* being the quantity available to the plant.

| Soil Type. | Percentage Soil Moisture. | | F.C.–W.P. |
|---|---|---|---|
| | Field Capacity. | Wilting Point. | |
| Tatchera sand .. .. | 16 | 10 | 6 |
| Tatchera sandy loam .. | 22 | 15 | 7 |

From this example it will be seen that there is a definite limit to the amount of water which can usefully be added to a citrus grove. If excess water is applied either accidentally or by design to carry the tree over a long period between irrigations it either wets a layer of soil below the root zone, and is not of use to the tree or worse still it creates a water table when held up by a clay layer and produces most unfavourable results.

### *Depth of Root Zone*

The aim of the irrigator then is to wet the root zone to its field capacity and no more. What is the depth of root penetration of our citrus trees ? How deep is this root zone we are endeavouring to raise to its field capacity ?

Citrus roots under our conditions are usually situated above a depth of 30 inches and often above 24 inches. The alkalinity, salinity, and risk of free water all tend to increase with depth in most of our Murray Valley soils and these things keep our citrus rather shallow rooted.

Three adjacent healthy Washington Navel trees on a patch of well-drained and deep phase of Barmera sand gave the results shown in (Fig. 2).

On the shallow phase Barmera sand near the foot of the slope where there has been a definite tendency towards a water table and where drainage has actually been necessary a healthy Washington Navel on Sweet Orange rootstock showed a much shallower root zone (Fig. 3).

It is a simple matter for every grower to put down a few holes and discover the depth of



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penetration of roots of his own trees. This, or a little more, provided no water table is developed, is the depth of soil to be wetted in an irrigation.

It is a common mistake for growers to think that, when the soil moisture in the root zone is becoming exhausted, the tree will send roots down rapidly searching for water below this zone and so use any excess water applied. The truth is that the roots of a tree become established only in that zone which is favourable for growth of roots throughout the year. Roots do not grow appreciably in the layers of soil which are only occasionally suitable for their development.

The deep penetration of the trees on the Barmera sand referred to previously, indicates that soil moisture and other soil conditions have been satisfactory to the depths indicated for long periods at a time.

### *Time Taken for Irrigation*

The depth of soil we desire to irrigate being fixed roughly by the root zone, it is necessary to know how long it takes for water from an irrrigation furrow to penetrate to this depth for this is the *length of time* water should be running in the furrow.

We must approximate here for simplicity and take 4 ft. as the greatest depth of soil it is wise and safe to wet in a light citrus soil such as *one of the sands* and 3 ft. as the corresponding depth of penetration on the *sandy loams.*

To penetrate 4 ft. in sand would take about *four hours* with normal sized furrows, and this seems the time of irrigation to aim at.

To penetrate 3 ft. on the sandy loams irrigation water would take, say, six hours.

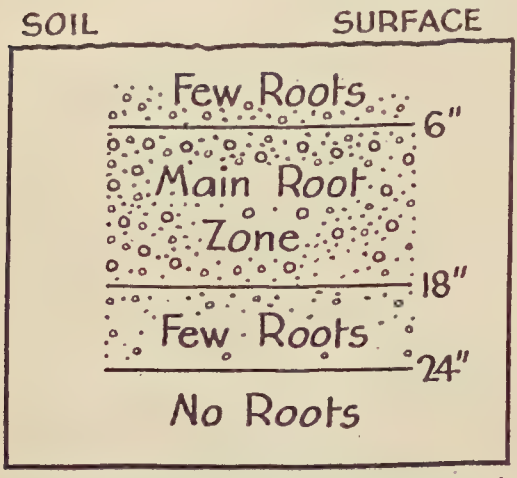


Fig. 3—Washington navel on Sweet Orange stock on shallow Barmera sand.

On heavier soils on which citrus is sometimes grown, up to 18 or 24 hours with very small furrows may be necessary. Of course, the irrigator should check these figures for himself with a shovel or soil auger, as he can easily do in the irrigation season.

### *Distance between Furrows*

The duration of irrigation being fixed we must decide the desirable spacing of furrows. The spacing depends on the soil type which decides how much side spread of water has occurred by the time sufficiently deep penetration has been obtained.

On the sands, downward penetration is fast and side-spread relatively small. Thus furrows in sands should be closer together and can be broader and shallower to cover a greater area of the surface.

On the sandy loams, and, of course, more particularly on heavier types, side-spread of water is greater in relation to downward penetration. Thus the furrows can be further apart. They can also, with advantage, be deeper furrows. These points are illustrated in the diagram (Fig. 4) of a penetration profile in Murray sand below a broad shallow furrow. If a trench is dug across the line of the furrow and water taken across the trench in a galvanized iron gutter, the penetration of water at any time can easily be seen as the wetted area on the wall of the trench.

On the above basis these broad, shallow furrows could be 4 ft. between centres, that is to say four furrows per row if the outside furrows are 6 ft. from the butts of the trees. They would run for about four hours.

*On a sandy loam* the penetration profile would be broader and shallower.

Such furrows should be about 6 ft. apart, that is three furrows per row and would run for about six hours.

*On heavier soil types,* even broader shallower profiles would be experienced and two furrows carrying a small flow for 18 to 24 hours would be the type of irrigation suggested.

### *Length of Furrows*

The previous suggestions as to spacing of furrows and time taken for irrigation are made on the assumption that the irrigation runs are of the proper order. There is no more serious fault in our irrigation layout on the lighter citrus soils than excessive length of irrigation run.

In discussing the spread and depth of penetration of irrigation water we have assumed that what happens in one spot can be made to happen uniformly over the whole field. Here the great difficulty lies. Under spray irrigation uniformity of application is not so difficult; but furrow irrigation suffers from the great disadvantage on light soils such as we now choose for citrus, that the top of the furrow is watered for a longer period than the bottom and tends to absorb much more water, and unless special precautions are taken we tend to get much deeper penetration of water near the top of the furrow than lower down. Fig. 6 diagrammatically illustrates this point.

Fig. 7 diagrammatically shows that the side spread of water at the top of such a furrow of excessive length may also be much greater than lower down and cause unequal application of water.

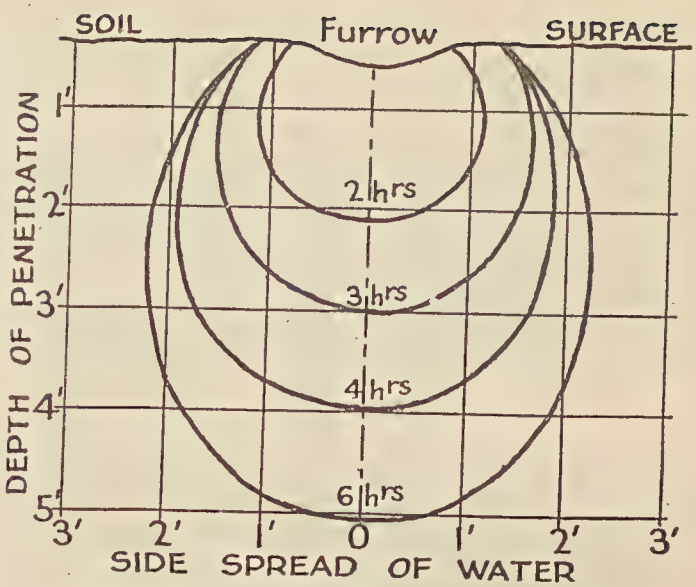

Fig. 4—Penetration of water from a furrow into Murray sand.

In general, experience has shown that, for citrus in sandy soils, furrows should not exceed 4 chains, and in sandy loams, 6 chains in length. In heavier soil types because of slower penetration much longer furrows can be used.

### *Varying the Stream in Furrows*

To distribute water more evenly along the furrow in a light soil it is wise to use a larger stream until the whole of the furrow is rather quickly wetted and then cut it back to one which just keeps the whole length of the furrow wet.

It may also be found useful after half the irrigation is given to cut out one or more of the furrows per row at the top of the run taking the water down in, say, half the furrows and splitting these into the full number of furrows at the lower end of the run. The proper number of furrows at the top must, however, be used in the earlier part of the irrigation at the top, and no single furrow used for too long, otherwise excessive penetration will still occur under the furrows used.

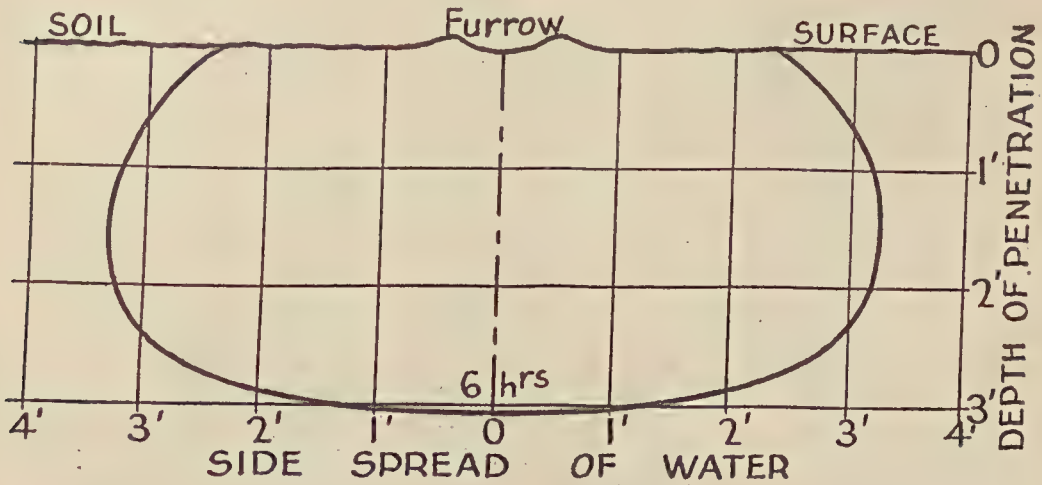

Fig. 5—Penetration into a sandy loam.

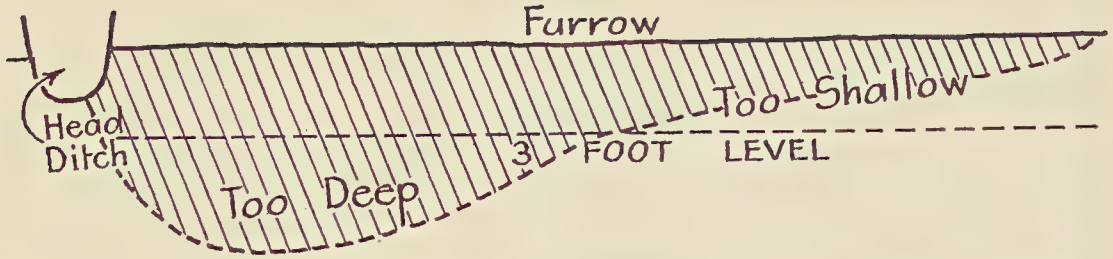


Fig. 6—Excessive penetration occurs near the top of furrows that are too long, with insufficient penetration towards the lower end of the furrow.

### *Change of Soil Type*

Perhaps a special word of warning is necessary on the light citrus soils, such as Murray sand, which permit very rapid penetration of water. Such deep soils with no impervious layers near the surface are usually placed at a high level. They appear to be nearly fool-proof, but, in fact, they often cause serious soil troubles through excessive irrigation. This trouble may not show up where the water is applied but more usually, owing to underground seepage, appears on a lower contour where such a sand runs into a heavier and shallower soil type such as a sandy loam.

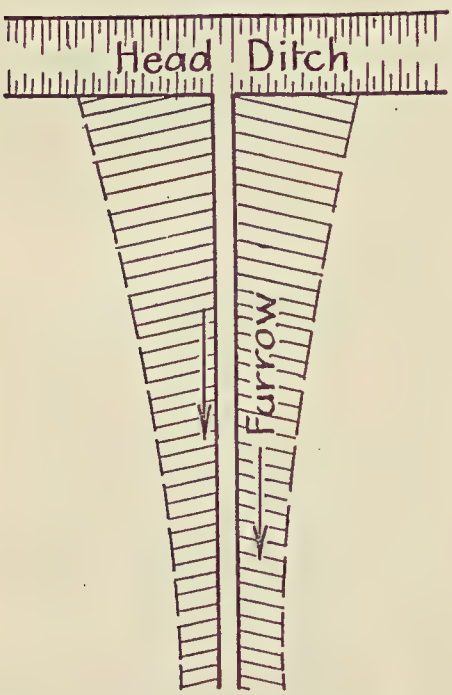


Fig. 7—Lateral spread of irrigation water in a light soil will be much greater at the top than at the bottom of a furrow which is too long.

If such a change of soil type occurs on a grove, a head ditch should, if possible, be placed between the two types so that the lower one can be irrigated separately.

Frequently the lower level is owned by another grower and this demonstrates the necessity for a community spirit in which all irrigators realize their obligation to their neighbours not to over-irrigate their land. Similarly, if the grade varies along the irrigation run, particularly if it is flatter at the top changing to steeper lower down, it is wise to construct another head ditch to enable the two grades to be watered independently.

### *Periodicity of Irrigation*

When the root zone has been wetted to its field capacity as described, sufficient water will usually have been given to keep the trees amply supplied for at least two months in cool spring weather, but for only, say, a month in midsummer.

There is no safe way of carrying most of our citrus groves over an extended period of six weeks to two months in summer without some wilting. Do not attempt to do this by applying an extra heavy irrigation. Beyond a certain limit, as we have seen, the soil cannot *safely* be charged with water, and it would be better to face the immediate disadvantage of a little wilting in the trees than to lay the foundation of future soil and root troubles by over-watering.

Citrus irrigation rosters should aim at frequent light waterings, say, at not longer than monthly intervals in hot weather.

In conclusion, it is pointed out that we are still short of irrigation data on our citrus soils. The Department of Agriculture hopes to resume now this work so seriously interrupted by more than five years of war; and to add progressively to the detailed practical advice available to growers on the several soil types.

# LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

STOCK owners should make sure that every ton of surplus pasture is conserved as hay this season. All kinds of fodder are likely to be scarce again, and will be difficult to buy at reasonable prices during the coming year. The scarcity of baling wire will restrict the activities of contractors and those farmers who conserve pressed hay direct from the sward. For this reason, it is likely that reduced quantities of pressed hay will be on sale. However, loose grass hay can be conserved and, if necessary, pressed from a stack when wire is available. This method of conservation is favoured by many leading stockmen, because the hay can be more readily protected from the bleaching effects of the sun and wind as the team can usually stack loose hay twice as quickly as it can be baled. Thousands of tons of grass hay are spoilt each year while lying out in the windrows awaiting the baling machine.

### *Feeding the Dairy Cow*

Dairy cows have a means of converting materials unsuitable for human consumption into milk, which is unsurpassed as a foodstuff. All the nutrients contained in the milk such as proteins, fats, lactose and mineral matter, are converted by the cow from the fodder consumed. In addition, the animal has to eat sufficient food to maintain her own bodily well-being and to provide nutriment for the unborn calf.

Although, during abnormal periods such as one of drought, many foodstuffs such as flax straw, gorse shoots, orange peel and melons are fed to cows, the normal rations of dairy cattle are usually limited to pasture, various types of hay, grain and cereal or other by-products.

Unless a cow receives adequate quantities of all the nutrients required for milk production in the rations the yield declines, although some cows make an effort to overcome any deficiency by drawing upon material stored in their own tissues. This, however, causes an inevitable loss of condition.

Protein is one of the important constituents necessary for milk production. This material, after being consumed by cows in their rations, is converted into the particularly high-quality milk protein. Abundant and luscious green pastures supply all the protein required for maintenance and milk production, but as the pasturage matures and dries off, its protein content decreases and becomes insufficient for the needs of milking cows. A protein deficiency is also likely to be experienced in the winter months when pastures, although green, are insufficient to balance hay and other supplements. Formerly this deficiency was easily overcome by feeding meatmeal or linseed meal, but the shortage of these protein-rich concentrates has been acute for several seasons, and there appears to be no prospect of improvement. In fact, as a result of the drought and the smaller number of animals being slaughtered, supplies of meatmeal may become even more restricted. Other foodstuffs which may be classed as protein-rich concentrates, such as peas and maize gluten meal (polly feed) are available only in limited quantities.

Except for those who may be near enough to the metropolitan area to purchase perishable protein-rich by-products such as brewers' grains, the majority of dairy farmers who have dry pastures will find it most difficult to provide rations containing sufficient protein for their cows during the late summer and autumn months.

Of the bulky fodders, well-cured lucerne or clover hays contain more than twice the amount of protein possessed by oaten hay, and are excellent roughages for milking cows. Lucerne hay which is stemmy or has lost a large proportion of its leaves is much inferior to the well-cured product. Pasture hay containing a large proportion of clover is also a valuable protein-rich roughage, but ordinary mixed grass and clover hay does not contain as much digestible protein as oaten hay.

(J. T. KELLY, B.Agr. Sc., Science Field Officer.]

### *White Colour Dominance in Pigs*

White hair-colour in pigs is dominant over black or red hair-colour, and the progeny of a white parent and a dark parent are so frequently white that some breeders are surprised when black or red pigs appear from such parents. If the white parent is registered in the herd book, its pedigree is sometimes looked upon with suspicion by the breeders who expected all white pigs from the mating.

The following explanation should interest breeders who have been concerned about the inheritance of colour in pigs. Each pig inherits one colour-determining factor from each of its parents. Thus each pig has two such factors, but it transmits only one of them to each of its progeny, and the one to be so transmitted is determined by chance at the fertilization of each egg in the sow.

If a pig inherits a white colour-factor from one parent, and a dark colour-factor from its other parent, it will be white or mostly white because the white is dominant and dark is recessive, but this pig may transmit either its white or its dark inherited colour-factor to its progeny.

If a pig receives white colour-factors from both parents, it will be white in colour, genetically pure for white, and can only transmit a white colour-factor to its progeny.

If a pig inherits a dark colour-factor from each of its parents, it will be dark in colour, being genetically pure for dark colour, and it can only transmit dark colour-factors to its progeny.

The degree of dominance of white over dark-hair colours in pigs varies. It appears to be greatest in the cross with Berkshires, the progeny being almost entirely white, but a few spots of black skin and hair are not uncommon. In the Large White x Tamworth, white is almost entirely dominant, but black or dark-red hair sometimes occurs in small patches. The Large White x Large Black, and the Large White x Wessex Saddleback are mostly white, but blue-roan and black skin under white hair occur fairly extensively on some pigs.

There have been cases where Large White boars when mated to dark-coloured sows of mixed breeding threw progeny with varying patterns of black, red and white, some nearly all white, and others wholly white. This indicates that the Large White boars were not genetically pure for white colour inheritance. Some of the sisters of those boars should be expected to be impure for white-colour inheritance, and if the brothers and sisters were mated together, both white and dark progeny should be expected.

Unless test matings are made, one cannot be sure whether the Large White boars which sired the dark pigs inherited the dark colour-factor from their sires or from their dams. Also, there is no certainty whether the dark colour-factor was introduced early or late in the ancestry of the boars concerned. The Large White, like most other breeds of pigs, was evolved by crossing and selection, and it is probable that dark colour-factors were introduced both before and after the closed herd-book for the breed was published.

The purity of pigs for inheritance of white colour-factors can be determined by mating them with black or red pigs, or pigs known to be genetically impure for white, when the absence of black or red colour in all of a fairly large number of the progeny may be taken as an indication of the purity of inherited white in their white parent. As this procedure is impracticable for most breeders of herd-book registered pigs, rash guarantees that pedigreed white pigs will produce white progeny from all matings should be avoided.

—[L. A. DOWNEY, Pig Expert.]

### *Phenothiazine for Worm Treatment in Sheep, Cattle and Horses*

The value of the drug phenothiazine as an effective worm medicine has not been adequately appreciated by a number of farmers. This drug which is prepared commercially under the trade names Phenovis, Phenzeen, and Phenovine, is effective against the large roundworm (*Ascaris*)

and blood worms (*Strongyles*) of horses, the hair worm and nodule worm of cattle, the hair worm, barber's pole worm and nodule worm of sheep and against the large round worm of pigs.

The drug may be used as a powder and given in the feed, but to ensure that each animal receives the requisite dose, it is advisable to use it as a drench. For this purpose the powder is mixed thoroughly with water at the rate of one pound of powder to one pint of water.

The dose rate for sheep is as follows:—Sheep, 12 months and over, $\frac{4}{5}$ oz.; sheep, 8 to 12 months, $\frac{3}{5}$ oz.; sheep, 4 to 8 months, $\frac{2}{5}$ oz.

Cattle are not so tolerant of the drug as sheep are, and care must be taken to avoid overdosing. This particularly applies when drenching calves or cattle in poor condition. The following may be taken as a maximum dose rate for cattle:—Adults, 1 oz.; cattle, 12 months old, $\frac{3}{4}$ oz.; cattle, 6 months old, $\frac{1}{2}$ oz.; cattle, 4 months old, $\frac{1}{3}$ oz.

Horses may show a physical reaction to a full dose of the drug and the recommended procedure is to divide the full dose shown hereunder into four equal parts and give one part each day for four days. Draught horses, 1 oz.; light draughts, $\frac{3}{4}$ oz.; yearlings and ponies, $\frac{1}{2}$ oz.

[G. Nicol, B.V.Sc., Veterinary Officer.]

### *Care of Poultry in Hot Weather*

Poultry-keepers are again reminded that special precautions are necessary to prevent high mortality amongst the birds from heat apoplexy during hot weather. The number of deaths that occur on each farm during a heat wave varies considerably. Many factors are involved, which influence the extent of mortality, and various means of reducing this loss to a minimum have been tried. Birds, especially fowls kept in large numbers under intensive conditions, are particularly subject to the effects of heat, more so than most mammals.

Generally, the most satisfactory results have been achieved by spraying the litter and the walls of the houses, and also the birds, with water at frequent intervals during the hottest part of the day.

General good management of the whole of the operations on a poultry farm, however, is the key to success, and this helps to reduce mortality to a minimum.

There should be ample room in the laying houses, as overcrowding causes the birds to become over-heated. A house 20 ft. square, 8 ft. high in the front and 6 ft. high at the back, with a 6-inch opening along the back under the roof, will allow of good ventilation, and provide sufficient room for 100 birds. Plenty of nests inside the houses are essential, and careful consideration should be given to ventilation.

Feeding on correct lines is necessary at all periods of the year. A suitable combination of clean wholesome foods, sufficient for the birds' requirements, is essential to prevent them from becoming lowered in vigour. It should be a rule never to allow the birds access to any unclean or decomposing foods, as these greatly interfere with their health. Naturally this should be especially guarded against during the summer months. There are many kinds of green food that may be fed, and it is important that the birds should be provided with a daily supply.

A most important consideration is the provision of a constant, plentiful, and easily accessible supply of fresh cool drinking water. Water vessels that may be reached by the birds under normal weather conditions are sometimes found to be difficult to reach when the birds become distressed during hot weather. Water vessels placed temporarily on the floors in the centre of the pens, as near as possible to the birds, have been of great advantage in this respect.

[H. F. Clinton, Poultry Expert.]

### *Bee-keeping*

Heavy losses of brood and field bees in the Goulburn Valley, due to arsenical spray used in the orchards in the vicinity of apiaries, occurred last spring. Losses from this cause are far too frequent, and bee-keepers would be well advised to remove their bees from the vicinity of orchards before spraying operations are likely to commence. The danger from arsenical spray is not confined to the fruit blossom only. Cape weed, flat weed and other ground flora in bloom under the trees and around the boundaries, after the petals of the fruit blossoms have fallen, remain a source of danger.

With a view to autumn queen rearing, colonies should now be checked, and those showing the most desirable qualities marked for a supply of young larvae when required.

The importance of the drone should not be overlooked, and colonies selected for the purpose of supplying the necessary drones should be given frames containing combs showing a reasonable proportion of drone cells.

[J. W. Thomlinson, Apiary Inspector.]

# The Control of Celery Leaf-Spot in Commercial Nurseries

By L. L. STUBBS, B.Agr.Sc., Assistant Plant Pathologist, Biological Branch.

IN Victoria, the only celery disease of economic importance is Leaf-Spot (Late Blight) caused by the fungal pathogen *Septoria apii-graveolentis Dorogin.* This disease has been a limiting factor to production in the Melbourne market-garden areas, where the bulk of Victorian celery is produced.

Celery Leaf-Spot has been particularly prevalent in both early and late plantings when moist cool conditions favoured the rapid spread of the parasite.

The most popular variety grown in Victoria, *Golden Self-blanching,* is very susceptible to the disease.

The practice of leading market gardeners has been to select their own strains for seed, or to obtain seed from growers who raise selected strains for market gardens. Most of this seed is grown in southern Victoria, where environmental conditions favour the infection of seed-crops and seed-borne infection is usually high.

Because of the difficulty of producing vigorous early seedlings in outdoor seed-beds, the principal celery growers usually supply their own seed to commercial nurserymen, who raise the seedlings under glasshouse conditions. The seedlings, when very small, are "pricked out" into shallow seedling flats, and when about 4 to 6 inches high, are "hardened-off" in cold frames, before they are supplied to market gardens. This method of producing seedlings, considerably shortens the growing season of celery, but unless vigorous disease-free seedlings are obtained, this initial advantage is lost.

During 1941, the Biological Branch was approached by a commercial nurseryman, who was experiencing losses due to an epidemic of "Leaf-Spot" in his glasshouse celery seedlings. The disease could only have been introduced in the seed, as the seedlings were raised in steam-sterilized soil.

Owing to the serious nature of the disease and the lack of information in Victoria as to the relative values of the various seed treatments recommended elsewhere, it was decided that an investigation of the problem should be undertaken.

### *Symptoms of Celery Leaf-Spot*

During the spring months, the warm humid atmosphere of a glasshouse is particularly favorable for disease development. Seedling growth is checked in a very early stage, and mortality is high.

The individual spots produced on the leaves of infected seedlings are rarely larger than $\frac{1}{8}$-inch in diameter; they are at first chlorotic, then brown, and eventually become grey or almost black in colour, owing to the presence of numerous black pin point fruiting bodies (*pycnidia*) embedded in the surface of the lesions. The lower leaves are usually most heavily spotted, and as the disease increases in intensity, the affected leaves shrivel and become necrotic as the spots coalesce.

When infected seedlings reach the transplanting stage, only an inner rosette of spotted leaves remain alive and root growth is reduced and exhibits a rusty discoloration. The establishment of such seedlings in the field is difficult, and if favorable conditions occur for the pathogen, the disease keeps pace with the development of new foliage and crop failure usually results.

If, however, environmental conditions are unfavorable for the growth of the fungus, infected plants may recover, but owing to the initial check imposed by the disease, the crop lacks vigour and yields lightly. At the blanching stage, the presence of boards surrounding each two- or three-row land, increases the atmospheric humidity surrounding the plants and the pathogen which is still present in a dormant state becomes active. Many growers have been forced to remove the boards two or three times to enable

Fig. 1—Septoria-infected celery "stalk" showing unattractive market appearance.

the plants to recover. An early celery crop treated in this manner is likely to run to seed, and produces inferior stalks.

The unattractive brown streaks and pits occurring on the outer petioles, and the spots and withered areas on the leaves, greatly detract from the market value of the blanched stalks. (Fig. 1.)

### *Causal Organism*

The spores of the fungal pathogen *Septoria apii-graveolentis Dorogin* are produced in fruiting bodies, which are embedded in the seed-coats (Fig. 2) and in lesions on the leaves and petioles of infected celery.

The fungus is carried over in the soil from season to season in diseased refuse from a previous crop.

The pathogen is favoured by cool weather, and disease spread is most rapid when moist growing conditions occur.

### *Control by Seed Treatment*

**Method.**—In a seed treatment experiment conducted at a commercial nursery, a sample of celery seed (var. Golden Self Blanching) 70 to 80 per cent. infected with *Septoria apii-graveolentis* was used.

Seven treatments were tested on samples of approximately 2,000 seeds and each treatment was replicated six times. Following treatment, each sample was sown separately in a seedling flat containing steam sterilized soil.

The boxes were then arranged in random fashion in blocks, in an unheated glasshouse from which other celery seedlings had been excluded. At the appropriate stage of development, 108 seedlings were pricked out at random from each replicate, into further seedling flats of sterile soil, where they were grown until ready for transplanting. The plants were finally hardened-off in cold frames. Throughout the experiment the seedlings were watered by overhead sprinkling.

Of the treatments tested T2, T3, T4, T6 and T7 had been recommended elsewhere (2, 3, 4, 6, 7) and T5 is a standard potato tuber dip (1, 5).

No attempt was made to obtain germination counts during the experiment because of the large number of seeds sown, and the very small size of newly-emerged celery seedlings. At the conclusion of the experiment, germination tests were conducted by the Seed Testing Laboratory on seed samples subjected to treatments 1, 4, 5 and 7. Treatments 2, 3 and 6, which gave poor results in the experiment were not included.

**Results.**—The results, which are listed together with the treatment details in Table 1 did not require statistical treatment as treatments 1, 4, and 7 were completely effective in eradicating Leaf-Spot and the untreated controls were heavily infected (Fig. 3).

Fig. 2—Celery seed infected with *Septoria apii-graveolentis* showing *pycnidia* embedded in seed coats and stalks.

TABLE 1.—RESULTS OF CELERY SEED-TREATMENT EXPERIMENT 1941–42. ALL TREATMENTS CONDUCTED AT A TEMPERATURE OF 70° F. UNLESS OTHERWISE STATED. SEED DRIED AT CONCLUSION OF TREATMENTS IN HOT AIR OVEN AT A TEMPERATURE OF 90° F. FOR FIFTEEN HOURS.

| —— | T1. | | | T2. | | T3. | | T4. | | T5. | | T6. | | T7. | | T8. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seed sown 21st Oct., 1941 | Soak in 40 per cent. formalin at a dilution of 1 in 20 for 30 mins. Rinse in cold running water for 15 mins. | | | Pre-soak in water at 80° F. for 30 mins., drain. Soak in 40 per cent. formalin at a dilution of 1 in 240 for 15 mins. Rinse in cold running water for 15 mins. | | Soak in mercuric chloride 1 in 1,000 for 30 mins. Rinse in cold running water for 15 mins. | | Pre-soak in luke-warm water (80° F.) for 30 mins., drain. Soak in mercuric chloride 1 in 1,000 for 15 mins. Rinse in cold running water for 15 mins. | | Soak in acid mercuric chloride (0·1 per cent. concentrated hydrochloric acid and mercuric chloride 1 in 1,000) for 15 mins. Rinse in cold running water for 15 mins. | | Pre-soak in water at 100° F. for 30 mins. Soak in mercuric chloride 1 in 1,000 at 100° F. for 30 mins. Rinse in cold running water for 15 mins. | | Soak in water at 118° F. for 30 mins. Soak in cold running water for 5 mins. | | Control. Untreated seed | |
| 28th Nov., 1941. Seedlings ready for pricking out | Leaf-Spot absent | | | Leaf-Spot present | | Leaf-Spot absent | | Leaf-Spot absent | | Leaf-Spot absent | | Germination completely inhibited | | Leaf-Spot absent | | Leaf-Spot present | |
| | | H. | D. | H. | D. | H. | D. | H. | D. | H. | D. | H. | D. | H. | D. | H. | D. |
| 22nd Dec., 1941. Seedlings in cold frame | R. 1 | 108 | .. | 90 | 18 | 108 | .. | 108 | .. | 108 | .. | | | 108 | .. | 34 | 74 |
| | R. 2 | 108 | .. | 104 | 4 | 108 | .. | 108 | .. | 108 | .. | | | 108 | .. | 44 | 64 |
| | R. 3 | 108 | .. | 100 | 8 | 108 | .. | 108 | .. | 108 | .. | | | 108 | .. | 36 | 72 |
| | R. 4 | 108 | .. | 48 | 60 | 105 | 3 | 108 | .. | 108 | .. | | | 108 | .. | 30 | 78 |
| | R. 5 | 108 | .. | 40 | 68 | 108 | .. | 108 | .. | 108 | .. | | | 108 | .. | 40 | 68 |
| | R. 6 | 108 | .. | 40 | 68 | ..* | .. | 108 | .. | 108 | .. | | | 108 | .. | 28 | 80 |
| 9th Jan., 1942 | Leaf-Spot absent | | | Severely infected | | No further development in R. 4 | | Leaf-Spot absent | | Leaf-Spot absent | | | | Leaf-Spot absent | | Severely infected | |
| | GERMINATION TESTS CONDUCTED BY THE SEED-TESTING LABORATORY. | | | | | | | | | | | | | | | | |
| 3rd March, 1942 | 4 per cent. in 13 days<br>21 per cent. in 21 days<br>Germination reduced by 45 per cent. | | | | | | | 9 per cent. in 13 days<br>20 per cent. in 21 days<br>Germination reduced by 47 per cent. | | 7 per cent. in 13 days<br>28 per cent. in 21 days<br>Germination reduced by 26 per cent. | | | | 10 per cent. in 13 days<br>19 per cent. in 21 days<br>Germination reduced by 50 per cent. | | 22 per cent. in 13 days<br>38 per cent. in 21 days | |

T = Treatment. H = No. of healthy plants. D = No. of plants infected with Leaf-Spot. R = Replicate.
*= Replicate number 6 in treatment—3 accidentally destroyed.

During the 1942–43 season, the most successful treatments were applied to bulk samples of seed at the aforementioned nursery.

All treatments proved to be equally effective when seed was sown immediately following treatment, but after storage for several weeks a marked decrease in germinability of seed subjected to the chemical treatments was evident. Seed treated with hot-water did not show any obvious decline in germinability, when stored over the same period.

For the remainder of the season and in the two following seasons (1943–44 and 1944–45) all celery seedlings produced at this nursery (1942–43—590,000; 1943–44—640,000, and 1944–45—740,000) were raised from hot-water-treated seed, and with the exception of two or three boxes in 1943–44 were completely free from Leaf-Spot.

In the two seasons before the inception of seed treatment, every box of seedlings was affected, and required continuous dusting or

Fig. 3—Top, infected seedlings raised from untreated seed. Lower, Healthy seedlings grown from a sample of the same seed hot-water treated.

spraying to keep the disease in check sufficiently to enable the plants to be marketed.

All lines of seed treated were examined microscopically, and invariably showed heavy infection with *Septoria apii-graveolentis*, and whenever small samples of untreated seed were sown, infected seedlings were produced.

Because of the good results obtained by growers who had planted seedlings raised from treated seed, the popularity of seed treatment increased, and during the 1943–44 and 1944–45 seasons it became necessary to treat lines of seed supplied by growers to other nurseries.

All the seed was treated at the Plant Research Laboratories in a thermostatically controlled water-bath with a sensitivity of ± 0·1° C., which had been designed for the original experiment.

By the end of the 1944–45 season, the volume of seed submitted for treatment was so great, that market-gardeners and nurserymen were advised that in future they would have to make their own arrangements for seed treatment. As a result, many nurserymen are installing water baths similar to that successfully used at the Plant Research Laboratories (Fig. 4)

### *Instructions for the Hot-Water Treatment of Celery Seed*

Growers should be prepared for some reduction in germination of celery seed as a result of hot-water treatment. The degree of reduction depends upon the quality and age of the seed to be treated. The 50 per cent. reduction in germinability of the seed sample used in the previously described experiment although rather severe, was not unexpected as the quality of the seed was very poor, only 38 per cent. of untreated seed being germinable.

Seed two years old or older should not be given the hot-water treatment.

Seed to be treated should be loosely enclosed in muslin or any loosely woven material. To ensure complete immersion the bag needs to be weighted externally. The seed should not occupy more than half the volume of the bag.

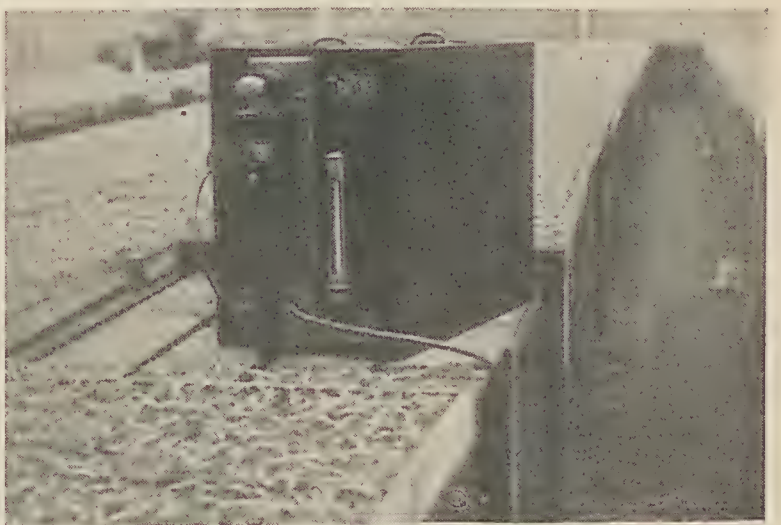

Fig. 4—Thermostatically controlled water bath in operation at a commercial nursery.

A more efficient container can be made from fine mesh brass wire gauze.

If the quantity of seed to be treated is greater than 1 lb. in weight, it should be divided and each half treated separately.

The temperature of the bath should be exactly 118° F. and an accurate thermometer is required for temperature adjustment.

To ensure uniform temperature distribution, the bag or container holding the seed should be agitated for several minutes after immersion.

Unless the bath is equipped with an automatic agitator, it will be necessary to stir from time to time during treatment.

The treatment period is exactly 30 minutes.

After treatment the seed is spread out in a thin layer on an absorbent surface to dry.

Seed should be dried as rapidly as possible.

A suitable wind-tunnel which greatly facilitates drying can easily be constructed with the aid of an electric fan and a heating element.


### *Summary*

Leaf-Spot (Late Blight) is a serious disease affecting Victorian celery.

The disease which is caused by the seed-borne fungus, *Septoria apii-graveolentis Dorogin* is particularly prevalent in commercially grown glass-house seedlings.

The results obtained from an experiment conducted at a commercial nursery showed that three treatments were equally effective in eradicating the fungus from infected seed.

The hot water method (118° F. for 30 minutes) proved to be most effective for treating seed in bulk.

During three seasons of bulk seed treatment, the method has completely controlled Leaf-Spot in seedlings grown in a commercial nursery.



#### Acknowledgment

The author desires to acknowledge the generous assistance given by Messrs. William Bone and Sons, Nurserymen, Carnegie, during the course of the investigations.


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## POST OFFICE AND CHRISTMAS GIFTS AND GREETINGS

Happy Christmas! What a wealth of meaning these two words convey this year. If you are posting remembrances to friends or relatives, the Deputy Director, Posts and Telegraphs (Mr. C. G. Brown) would like you to:—

Post before the 15th December if possible;

Address all mail plainly and fully;

Pack all gifts carefully and show the name and address of the sender, preceded by word "from".

For 1½d. postage only five words of greeting may be written on a Christmas card and the envelope must not be sealed, otherwise a surcharge of 2d. will have to be paid on delivery. If the envelope is sealed, even with ends partly cut open, the charge is 2½d.

Business firms can help the Post Office by lodging large postings of commercial and advertising matter not later than the 8th December and tying the articles into bundles of city, suburban, country and interstate addresses.

# IN THE ORCHARD

By G. W. GAYFORD, B.Agr.Sc., Horticultural Inspector

### *Prevention of Fruit Drop*

PLANT hormones are substances which occur in plants in very small quantities and have an important influence on some of the growth processes. Since the isolation of these substances from plants, chemists have been able to manufacture them artificially. Investigations have shown that these synthetic hormones can be used in a number of useful ways to hasten or delay various processes in plant life to the benefit of primary producers. Some of the ways in which hormones may be used include the prevention of certain varieties of pears and apples from dropping prematurely and the striking of cuttings of some ornamental trees and shrubs. Some other uses for hormones which show promise, but on which investigations are not yet sufficiently advanced to enable definite recommendations to be made, include the delaying of blossoming in fruit trees so that they may escape frost damage, application on tomato and strawberry flowers to obtain fruit without the usual pollination, delaying the sprouting of bulbs and tubers and the destruction of weeds amongst field crops and orchards.

Prevent pre-harvest drop of fruit by using hormone sprays.

For fruit growers, the main practical value of hormones lies in their ability to prevent fruit from dropping just prior to harvest. Hormone sprays have been of particular value on Williams' pears and Jonathan apples because both these varieties frequently drop heavily under certain conditions. The dropping of the fruit is a natural process, the theory being that a layer of cells in the stalk of the fruit no longer adheres to an adjacent layer when the supply of hormone in the fruit becomes low and, therefore, the fruit is no longer supported. The withdrawal of hormone usually does not occur until the fruit is ripe, but it occurs prematurely in some varieties, particularly during hot, windy weather. Sprays containing the hormone in extremely dilute concentrations of 5 to 10 parts per 1,000,000 are sufficiently strong for some of the hormone to be absorbed and so to prevent the formation of an abscission layer of cells in the stalk.

The hormones are available in tablet and liquid form, both of which may be used. In correctly timing the sprays it is best to estimate the likely picking date and apply the spray ten to twelve days ahead of this time. The sprays last for periods ranging up to twenty days, but twelve days should be regarded as the maximum period over which they are effective. The spray may be mixed without loss of efficiency with lead arsenate or white oil sprays for codling moth control.

In order that the hormone will be absorbed by the fruit, particularly at the stalk end, spraying should be thorough.

Hormone sprays may have the effect of enabling fruit to remain on the trees beyond the normal period of maturity. Growers who use the spray should be guided, therefore, by the usual signs of maturity, i.e., a change in the ground colour of the skin of the fruit from dark green to yellowish green. Do not allow fruit to remain on the trees beyond the normal picking time to obtain increased size or colour, otherwise Williams' pears may arrive at the cannery in an overmature condition or Jonathan apples will have a shortened life in the cool store.

### *Care of Grafts*

Because of shortage of skilled labour, there has not been a great deal of re-working of fruit trees done this year, and what has been done has mostly been of the simpler top-working method as distinct from frameworking. However, whatever the method, regular inspection of the grafts is necessary for a month or two after the grafting operation. If the grafts are growing strongly in an exposed situation, wind may break some of the grafts and produce an unbalanced tree. Damage may be avoided by tying the new growth to a stake nailed to the stump. Another method is to top the new growth, reducing the length by one-third at this time of the year. The sealing material should also be inspected and any cracks resealed.

### *Citrus Scale Insects*

For the control of scale insects which infest citrus trees, a spray of white oil emulsion, strength 1 gallon in 40, should be applied now. It is not safe to spray citrus with white oil emulsion sooner than six months following a Bordeaux spray.

# SUPERPHOSPHATE DELIVERIES

THE Director of Agriculture, Mr. H. A. Mullett, has been advised by the fertilizer manufacturers that unless more orders are lodged for November and December delivery, it would be impossible to deliver the increased quantities available in time for seasonal use. It is essential that considerable quantities be distributed before the end of December, 25,000 tons being the objective for the month.

The quota for distribution in Victoria in the year ending 30th June next is 362,795 tons as compared with the 279,474 tons last year. All users will share in this increase, the ration for non-priority crops having been increased by 50 per cent., except in the case of large users.

Not since 1937–38 has such a large quantity of superphosphate been manufactured, and both the railways and manufacturers will have great difficulty in meeting the programme. The uncertain position regarding coal, transport and labour is well known, and it will not be practicable to deliver most of the superphosphate in March and April as was the practice in pre-war days. Large distributors, such as butter factories, are urged to arrange early deliveries to their clients.

It is fully realized that users do not desire to store superphosphate on the farm for long periods prior to use, but those who refrain from arranging early delivery in the present circumstances may not be able to obtain their superphosphate at all.

The quality of the superphosphate being made this year is not quite equal to pre-war standards, but it is the best which can be made from the lower quality phosphate rock available. If the bags of fertilizer are placed on end and not stacked in high heaps, setting will be reduced to a minimum.

Only a few months remain before the optimum time for top-dressing pastures, and it is suggested that this work be done earlier in 1946 than is usually the case, so obtaining the maximum response to the top-dressing, and in addition spreading the work of delivery.

Mr. Mullett advises users of superphosphate to take delivery of their fertilizer as early as practicable, and thus avoid the necessity of introducing a quota system under which deliveries to each user would be limited to a percentage of his ration.

# THE FLOWER GARDEN

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley Gardens

BECAUSE of water restrictions many gardeners may find it difficult to keep their plants adequately watered during the summer. Unless a permit is obtained from the Melbourne and Metropolitan Board of Works, watering must be carried out by sprinklers held in the hand and not by permanent spray systems or stationary sprinklers. Undoubtedly the best results from watering are obtained when water is applied in a fine misty spray which falls gently on the plants and soaks slowly into the soil. This form of spray compares with a light rain falling over a long period.

Many gardeners notice that much better growth is obtained from water in the form of rain than water applied from the hose. There are many explanations for this, and probably two of the important ones are that during regular rainfall the atmospheric conditions are moister and remain so for longer periods than under the sprinkling system. The other factors are probably due to the small amounts of nitrogen which are brought down in rainfall and also for a certain aeration of the soil due to air carried down by rain.

The use of heavy coarse sprays is not desirable, except perhaps on very porous soil. On other soils, such sprays usually succeed in wetting the surface quickly, causing the soil particles to run together, and then water which falls subsequently tends to run off rather than soak in. This tendency can be reduced by having the surface of the soil as rough as possible. Always give sufficient water to soak well into the soil at each watering. Light sprinklings are wasteful and do not promote good growth in plants. The action of water in the soil should be one of continuous movement, and this movement should be in the direction of the root system. If the roots are encouraged by light sprinklings to come to the surface instead of the water going down to the roots, the plants will suffer through lack of water in hot weather unless the sprinkler is frequently applied. This is usually impossible in most gardens.

All gardeners, until they can judge the water requirements of their soils, should investigate the depth of penetration of the water they apply at one time. One of the best methods of finding out to what depth the water has penetrated is to dig a small hole in various parts of the garden to a depth of 1 or 2 ft. and ascertain whether the soil is moist enough to support plant growth.

Two practices in the garden which can save water are hoeing and mulching. Frequent hoeing breaks up the surface crust of the soil and allows

water to soak in quickly. It also destroys weeds which would otherwise use up water intended for the garden plants. Mulching consists of spreading a 2 or 3 inch thick layer of manure or compost over the surface of the soil around the plants. Lawn clippings and weeds taken from various parts of the garden can also be used for this purpose. Prior to spreading the mulch it is a good plan to break up the surface of the soil by a light forking or cultivation with a three-prong cultivator. Mulch is then spread over the surface, and this mulch keeps the surface soil cool and moist and will suppress weed growth, particularly if a thick layer of "strawy" manure is used. The advantage of a good mulch of manure or compost is that as the material rots away it provides the plants with additional food materials. Most annuals, perennials, and particularly plants like the dahlia, benefit greatly by a good mulch of manure. These are mainly surface feeding plants, and our soils usually become too hot and dry to grow them well without some form of mulch.

In the shrubbery probably the most economical way of using water is to excavate a shallow basin, either on one side or around the shrub or tree, and to fill this with water, and when the water has soaked away to place a thick layer of well-decayed manure or dried weeds, lawn clippings, &c., in the hole. Subsequent waterings can be applied to the same basins and the mulch will prevent rapid drying out of the area.

### *Iceland Poppies*

Gardeners who desire to have Iceland poppies blooming during April and May and throughout the winter and early spring months should sow seed this month or in early January.

Choose a cool, somewhat shady place for the seed bed, and protect it from the hot sun by means of a light hessian cover or prunings from bamboos, tea-trees, or shrubs. The seed, which is very fine, should be mixed with four or five times its volume of clean sand before sowing. This ensures an even and thin sowing, and results in much better plants when transplanting time comes.

There are many good strains of Iceland poppies on the market—*Gartford Giants* can be obtained in art shades and daffodil tones, and mixed as well as self colours are available. One of the best orange shades is *Florist's Orange*; a good yellow is *Kotara Yellow Giant.* Other varieties are—*Glory of Newcastle*, which is a giant mixed pink strain, *Orange Noonday, Spectrum*, "*Sunny*" *Giants, Sunray, Goodwin's Victory Giants, Lustrous Giants*, and *Strathfield Superb Giants, Sunbeam*, mixed colours, and *Artists' Glory.* Of the pinks, *Coonara Pinks* and *Westella Pink Improved* are good pink colours, but unfortunately the flowers are small and stems are short when compared with the large giant varieties mentioned above. It is quite likely that a giant flowering strain of good pink Iceland poppies will be available either this season or next season.

## THE VEGETABLE GARDEN

### *Sweet Corn*

Another sowing of this useful crop can be made this month. When growing, it is an attractive plant in the vegetable garden and provides useful shelter from winds and shade for lettuces and beans during the hot summer months.

The best variety is *Golden Bantam.* Seeds should be planted about 1 inch deep in rows spaced about 3 to 4 ft. apart and 12 to 18 inches between the plants. The usual practice is to plant two or three seeds at intervals of 15 inches, and to remove all but one when the seed has germinated and is growing strongly. It is a crop which requires a good deal of moisture and a rich soil. Under these conditions the plant tillers well and produces a good crop of cobs.

### *Asparagus*

Cutting of asparagus should cease during late November or early this month, and for the next two or three months the bed should be carefully tended. Gardeners frequently neglect the asparagus bed after the crop has been cut. This is rather a short-sighted policy, because the attention given during the summer and autumn results in strong crowns being built up for the production of well-grown tips next spring.

Market garden manure used at the rate of 4 or 5 oz. to the square yard, lightly forked into the surface and covered with a mulch of manure or compost, followed by frequent waterings, will stimulate the growth of the tops. In turn these well-grown tops will build up food reserves for storing in the crowns, and result in better production next spring. Some growers apply salt to the asparagus bed, but this is unnecessary if an adequate manuring practice is followed.

### *Potatoes*

Late varieties of potatoes, such as *Snowflake* and *Carman No.* 3, can be planted now. Tubers should be 2 to 3 oz. in weight, or if larger should

Method of pruning tomatoes

Pruning consists of pinching out the laterals and retaining 1, 2 or 3 leaders. "A" denotes where the lateral growths should be pinched out and "B" the flower "sets" or fruit. When the plant reaches the top of the stake, pruning can be discontinued.—If early varieties are grown and early fruit is required, the top of the plant should be pinched back about the height of the top of the stake.

be cut up to form pieces approximately 1½ to 2 inches in diameter. Each piece should contain at least one good eye. Plant the "seeds," as they are called, about 5 inches deep, and space the plants about 16 inches apart, with 2 to 2 ft. 6 inches between the rows. When preparing the soil dig in a mixture of superphosphate and sulphate of ammonia in the proportion of six parts to one part, at the rate of 3 to 4 oz. to the square yard. Do not apply lime to the soil as this causes scabby skins.

### *Tomatoes*

Tomato plants will require constant attention if they are to be pruned and tied to stakes. Pruning needs to be done at least once a week, and the young growth in the axils of the leaves should be pinched off. Remove diseased plants and burn them, and mulch beds with compost or well-decomposed stable manure. Side dressings of fertilizer can be given to the plants when the fruit commences to set. Over stimulation with nitrogenous manures may result in reduced crops. Potash and superphosphate will be found useful, with a small proportion of nitrogen added. The ratio of the former to the latter should not be more than 5 : 1.

### *French Beans and Runner Beans*

Another sowing of French beans can be made this month and also Scarlet Runner beans. The dwarf French bean should be planted 1 to 2 inches deep and seed placed about 5 inches apart, with 2 to 3 ft. between the rows. Climbing beans should be planted about the same depth, and seed placed about 9 inches apart. They are most conveniently planted against walls or fences, or, if desired in the open garden, a temporary trellis work may be erected for them. This crop, if grown in the open, also provides good shelter for lettuces during the summer months.

"Glenloth Pansy" 636 lb., and "K. Gaiety" 595 lb. butterfat. Mr. Tomlinson's "Nigger" and Mrs. Findlay's "Marina" have established themselves as high producers by their duplication of such excellent yields. "Nigger's" 1944 effort of 633 lb. has been followed by one of 703 lb. butterfat.

Dr. D. Fehring's "Heather" has exceeded the 600 lb. level on each of the past two years, and must be reckoned as a really great cow—for her yields were made on pasture only. Mrs. A. Lee's "Duchess" (582 lb. and 577 lb. butterfat), also can be regarded as an outstanding cow, while "Norma" owned by Mr. Lyle Ludeman of Ecklin South, is worthy of mention. This young cow led the two-year-olds last year with 470 lb. butterfat, and as a three-year-old exceeded the 600-lb. level. Mr. C. Runciman of Swan Hill, is represented by "Bideford Trixie 3rd" (669 lb. butterfat). Last year it was "Bideford Sapphire 8th". Another great junior cow is "Adeline", 611 lb. butterfat, which heads the four-year-olds, and is owned by Mr. J. A. McKinnon of the Warrnambool Association.

Leongatha leads all units with six cows among the "best twenty". Mr. W. H. Hollyoak's fine herd is represented by "Beryl" a 610 lb. butterfat cow; while Mr. G. J. Howell, who has been prominent for many years, has two representatives in "Linda" 581 lb., and "Jessie", her daughter, with 609 lb. butterfat.

ASSOCIATIONS GROUPED ACCORDING TO AREA AND PRODUCTION.

| Association. | Herds. | Tested Cows. | Percentage of Heifers. | Number of Pure Bulls. | Average Butterfat. |
|---|---|---|---|---|---|
| | | | % | | lb. |
| **GIPPSLAND AREA.** | | | | | |
| Dumbalk North | 26 | 1,087 | 36 | .. | 275 |
| Korumburra No. 1 | 26 | 1,044 | 41 | 22 | 267 |
| Leongatha No. 2 | 26 | 870 | 45 | 22 | 267 |
| Loch | 23 | 822 | 43 | 3 | 264 |
| Korumburra No. 2 | 25 | 1,012 | 40 | 24 | 261 |
| Yinnar | 25 | 930 | 36 | 25 | 254 |
| Maffra No. 2 | 8 | 221 | 40 | 7 | 253 |
| Gainsborough | 24 | 1,069 | 40 | 28 | 250 |
| Mountain View | 24 | 936 | 47 | 15 | 249 |
| Leongatha No. 1 | 24 | 1,046 | 46 | 22 | 247 |
| Pakenham | 22 | 781 | 51 | 37 | 245 |
| Narracan No. 1 | 27 | 685 | 40 | 21 | 242 |
| Korumburra No. 3 | 27 | 1,096 | 44 | 30 | 235 |
| Fish Creek | 26 | 1,042 | 31 | 22 | 235 |
| Bass | 26 | 891 | 54 | 24 | 231 |
| Narracan No. 2 | 24 | 837 | 41 | 15 | 228 |
| Kongwak | 23 | 1,016 | 43 | 19 | 226 |
| Toora-Welshpool | 25 | 860 | 37 | 22 | 224 |
| Boolarra | 31 | 1,090 | 45 | 31 | 222 |
| Traralgon No. 1 | 32 | 1,281 | 49 | 38 | 221 |
| Maffra No. 1 | 23 | 743 | 38 | 21 | 219 |
| Stony Creek | 26 | 793 | 43 | 22 | 215 |
| Bairnsdale | 27 | 902 | 38 | 27 | 212 |
| Foster | 26 | 891 | 43 | 24 | 206 |
| Total 24 | 596 | 21,945 | 43 | 540 | 227 |
| Traralgon No. 2 and Yarram reports were not to hand when this report was prepared. | | | | | |
| **NORTH EASTERN AREA.** | | | | | |
| Tallangatta | 21 | 1,140 | 34 | 32 | 221 |
| Swanpool | 33 | 1,028 | 47 | 33 | 213 |
| Eskdale | 21 | 872 | 41 | 18 | 204 |
| Milawa | 26 | 739 | 43 | 22 | 188 |
| Rutherglen | 22 | 513 | 38 | 18 | 186 |
| Myrtleford No. 1 | 20 | 987 | 47 | 24 | 182 |
| Upper Murray | 23 | 1,154 | 31 | 10 | 175 |
| Myrtleford No. 2 | 25 | 849 | 50 | 15 | 173 |
| Moyhu | 21 | 686 | 38 | 22 | 167 |
| Chiltern | 22 | 683 | 37 | 19 | 156 |
| Total | 234 | 8,651 | 41 | 213 | 185 |

### Western Area.

| | | | | | |
|---|---|---|---|---|---|
| Gellibrand | 27 | 1,160 | 42 | 21 | 269 |
| Ecklin South | 23 | 950 | 45 | 25 | 238 |
| Warrnambool No. 1 | 20 | 860 | 40 | 19 | 236 |
| Cobden | 26 | 1,008 | 43 | 21 | 235 |
| Warrnambool No. 2 | 19 | 1,132 | 42 | 18 | 220 |
| Camperdown | 22 | 766 | 42 | 21 | 217 |
| Port Campbell | 26 | 956 | 41 | 23 | 213 |
| Paschendale No. 1 | 21 | 1,107 | 40 | 25 | 204 |
| Pomborneit | 22 | 1,007 | 37 | 24 | 193 |
| The Sisters | 20 | 894 | 41 | 21 | 191 |
| Ballarat | 27 | 664 | 46 | 29 | 191 |
| Mortlake | 15 | 775 | 51 | 14 | 181 |
| Paschendale No. 2 | 13 | 846 | 20 | 13 | 170 |
| Casterton | 16 | 644 | 41 | 16 | 145 |
| Condah | (No details owing to loss of herd-tester.) | | | | |
| Total | 297 | 12,769 | 38 | 286 | 209 |

### Goulburn Valley Area.

| | | | | | |
|---|---|---|---|---|---|
| Cohuna | 25 | 1,104 | 45 | 25 | 281 |
| Stanhope | 25 | 886 | 48 | 18 | 269 |
| Tongala | 27 | 1,017 | 45 | 35 | 265 |
| Rochester | 26 | 864 | 52 | 29 | 263 |
| Swan Hill | 30 | 846 | 45 | 36 | 252 |
| Katandra | 25 | 672 | 63 | 19 | 242 |
| Undera | 25 | 978 | 42 | 32 | 240 |
| Kerang | 32 | 1,117 | 64 | 31 | 233 |
| Kyabram | 26 | 752 | 44 | 17 | 208 |
| Dingee–Calivil | 22 | 633 | 37 | 18 | 200 |
| Merrigum | 25 | 781 | 45 | 21 | 175 |
| Total | 288 | 9,650 | 48 | 281 | 239 |

## Twenty Leading Cows with Details of Ownership, Identification and Production.

| Owner. | Association. | Name of Cow. | Identification. | Milk. | Test. | Butterfat. |
|---|---|---|---|---|---|---|
| | | | | lb. | % | lb. |
| Mrs. D. M. Findlay* | Leongatha | Glenloth Marina | Regd. Jersey | 11,983 | 6·05 | 725 |
| H. Tomlinson* | Tongala | Nigger | T.12. 18 | 13,001 | 5·41 | 703 |
| C. M. Runciman | Swan Hill | Bideford Trixie 3rd | Regd. Jersey | 11,829 | 5·66 | 669 |
| W. T. Collier | Loch | Daphne | ∠ 85. 1 | 10,963 | 5·99 | 657 |
| Mrs. D. M. Findlay | Leongatha | Glenloth Pansy | Regd. Jersey | 10,143 | 6·27 | 636 |
| C. Larson | Gellibrand | Blonde | ◇.5 | 11,334 | 5·56 | 630 |
| Taylor and Weise | Rochester | Girlie | R.5. 13 | 10,052 | 6·25 | 628 |
| A. Walker | Yinnar | Peerless | Y.83. 3 | 11,544 | 5·42 | 626 |
| J. A. McKinnon | Warrnambool | Adeline | AW.13. 6 | 11,079 | 5·51 | 611 |
| W. H. Hollyoak | Leongatha | Beryl | L.12. 26 | 10,380 | 5·88 | 610 |
| D. Fehring* | Rochester | Heather | R.31. 13 | 10,997 | 5·55 | 610 |
| J. G. Howell | Leongatha | Jessie | L.14. 259 | 10,822 | 5·63 | 609 |
| Gardiner Brothers | Toora–Welshpool | Island Lotus | Regd. Jersey | 9,995 | 6·08 | 608 |
| R. Trease | Dumbalk North | Charm | D.2. 82 | 10,377 | 5·85 | 607 |
| Lyall Ludeman* | South Ecklin | Norma | ∃K.36 | 10,572 | 5·68 | 601 |
| Mrs. D. M. Findlay | Leongatha | K. Gaiety | Regd. Jersey | 10,058 | 5·92 | 595 |
| F. C. Wilson | Tongala | Jersey | T.15 11 | 8,922 | 6·67 | 595 |
| J. G. Howell | Leongatha | Linda | L. 14. 161 | 11,126 | 5·22 | 581 |
| Mr. and Mrs. A. Brewer | Myrtleford | Bella | Z.46 113 | 10,754 | 5·39 | 580 |
| A. Lee* | Cohuna | Duchess | C.40. 73 | 10,238 | 5·64 | 577 |

* Appeared in last year's lists.

## Summary of Association Herd Test Data for Year Ended 30th June, 1945.

| Area. | Units. | Herds. | Tested Cows. | Junior Cows Under Five Years of Age. | | Pure Bred Bulls. | | Average Number of Cows in Herd. | Average Yield per Cow. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Juniors. | Per Cent. | Bulls. | Per Cent. | | Milk. | Test. | Butter-fat. |
| | | | | | | | | | lb. | % | lb. |
| Gippsland .. | 24 | 596 | 21,945 | 9,317 | 43·0 | 540 | 91·0 | 37·0 | 4,747 | 4·78 | 227·0 |
| Western* .. | 14 | 297 | 12,769 | 4,825 | 38·0 | 286 | 96·0 | 43·0 | 4,688 | 4·46 | 209·0 |
| Goulburn Valley | 11 | 288 | 9,650 | 4,672 | 48·0 | 281 | 98·0 | 34·0 | 5,287 | 4·52 | 239·0 |
| North-Eastern .. | 10 | 234 | 8,651 | 3,582 | 41·0 | 213 | 91·0 | 37·0 | 4,008 | 4·57 | 185·0 |
| Totals .. | 59 | 1,415 | 53,015 | 22,396 | 42·0 | 1,320 | 93·0 | 38·0 | 4,654 | 4·68 | 218·0 |

* Condah Association Report was not prepared owing to the Tester leaving half way through the year's operations.

Traralgon No. 2 and Yarram reports were not to hand when this report was prepared.

## Association Herd Test Data of Previous Years.

| Year. | Units. | Herds. | Cows. | Juniors. | Per Cent. | Bulls. | Per Cent. | Average Number of Cows in Herd. | Average Production per Cow. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Milk. | Test. | Butter-fat. |
| 1943–44 .. | 31 | 782 | 27,346 | 14,988 | 54·0 | 805 | 103·0 | 35·0 | 4,740 | 4·7 | 223·0 |
| 1942–43 .. | 25 | 623 | 22,154 | (Details affected by war conditions) | | | | 35·0 | 4,959 | 4·7 | 237·0 |
| 1941–42 .. | 40 | 946 | 34,218 | ,, | ,, | ,, | ,, | 36·0 | 4,960 | 4·74 | 235·0 |
| 1940–41 .. | 70 | 1,645 | 60,108 | 25,988 | 42·6 | 1,390 | 85·0 | 36·0 | 5,200 | 4·7 | 245·0 |
| 1939–40 .. | 101 | 2,346 | 84,690 | 34,723 | 41·2 | 2,004 | 85·0 | 36·0 | 5,450 | 4·79 | 261·0 |
| 1938–39 .. | 100 | 2,275 | 79,805 | 34,248 | 42·9 | 1,904 | 83·6 | 35·0 | 4,749 | 4·7 | 221·0 |
| 1937–38 .. | 104 | 2,401 | 86,048 | 37,467 | 43·5 | 1,969 | 83·0 | 36·0 | 4,876 | 4·7 | 227·0 |
| 1936–37 .. | 107 | 2,350 | 80,528 | 36,106 | 45·0 | 1,874 | 81·0 | 34·3 | 5,076 | 4·80 | 244·0 |
| 1935–36 .. | 108 | 2,416 | 80,817 | 37,817 | 47·0 | 1,946 | 81·0 | 33·0 | 4,934 | 4·7 | 233·0 |
| 1934–35 .. | 113 | 2,446 | 79,701 | 36,116 | 45·3 | 1,991 | 81·4 | 32·6 | 5,309 | 4·59 | 244·0 |
| 1933–34 .. | 134 | 2,910 | 92,953 | 43,394 | 46·0 | 2,214 | 76·0 | 31·7 | 4,723 | 4·51 | 212·0 |
| 1932–33 .. | 141 | 3,383 | 104,009 | 46,392 | 44·6 | 2,619 | 77·0 | 31·0 | 5,290 | 4·55 | 241·1 |
| 1931–32 .. | 130 | 3,098 | 89,619 | 36,946 | 41·3 | 2,323 | 75·6 | 29·0 | 5,393 | 4·58 | 247·3 |
| 1930–31 .. | 132 | 3,085 | 90,360 | 32,867 | 36·4 | 2,251 | 73·0 | 29·0 | 5,383 | 4·30 | 234·0 |
| 1929–30 .. | 116 | 2,604 | 76,032 | 24,439 | 32·1 | 1,653 | 71·0 | 29·0 | 4,944 | 4·59 | 226·1 |
| 1928–29 .. | 96 | 2,229 | 63,277 | 19,246 | 30·4 | 1,354 | 64·0 | 30·0 | 5,080 | 4·38 | 223·3 |

# Home Preservation of Fruit Juices

By RUTH BROMFIELD,
Fruit Preserving Expert

FRUIT juices are becoming more widely used in present day diets because of their health-giving properties. Processing in the home is simple, requires no special equipment, and is a useful means of storing a supply of fruit juices for summer drinks, particularly those made from lemons and oranges at a time when citrus fruits are scarce.

Fruit juices, especially from berry fruits provide Vitamin C—black currant is one of the richest in this vitamin—and are also of value in fever and gastric cases when fruit and vegetable in their natural forms are forbidden.

Fruit suitable for juice extraction are apples, berry fruits, citrus fruits, grapes, passion-fruit, plums, pineapples and tomatoes.

If the highest nutritive value of the juices is to be derived, the following precautions should be taken.

Carefully select the fruit, using only sound specimens. Discard any mouldy or decayed fruit, as even a small proportion of such fruit will give an off flavour and may result in failure.

Process the fruit as soon as possible after it has been gathered as the vitamin C content will be retained more completely if fresh fruit is used.

Do not use galvanized utensils, chipped enamel-ware, or tin-ware that is not well-tinned, as this may result in a reduction in the vitamin C content of the fruit. The contact of the fruit juice with iron or copper will cause sufficient of these metals to come into solution to bring about a rapid loss of vitamin C, as well as to produce a metallic flavour.

Prolonged exposure of the juice to the air also will cause loss of vitamin C, therefore, before extracting the juice have everything ready to complete the bottling quickly. Extract the juice as rapidly as possible and avoid undue contact with the air. When bottling, avoid unnecessary stirring, and process immediately after extraction.

If a large quantity of fruit is to be handled, the extraction and processing of a limited quantity of fruit should be completed before more juice is extracted.

Any bottles with well-fitting corks for storing the juices or preserving jars may be used.

The sterilizing vessel should be deep enough to hold the bottles and be covered with a lid. Use a small wooden stand in the container to prevent the jars coming into contact with the base of the vessel. A kerosene tin makes a useful sterilizer.

*Hard fruits such as apples and pine-apples* should be grated or put through a mincer, using the coarse grinder. The pulp is then transferred to a muslin bag and the juice squeezed through. If available, a juice extractor may be used.

*Berry fruits, black currants and grapes* yield more juice if they are crushed and heated over hot water until the juice runs freely. They are then strained.

*Citrus fruits* are extracted on a cone extractor, but the juice is not strained.

*Tomatoes.* Cut the tomatoes up roughly and drop into a pan in which there is an inch of boiling water. Boil rapidly for about 10 minutes or

until the tomatoes are soft, keeping the pan covered. Rub the hot, softened tomatoes through a fine colander to remove the seeds and skins.

*Plums.* Weigh and crush the plums and add 1 pint water to each 1 lb. of fruit. Simmer till the fruit is soft. Drain, then squeeze through a cloth and strain the juice through three thicknesses of muslin.

*Passion-fruit.* Remove the pulp and strain if desired. It is unnecessary to add sugar before processing, although most juices are improved in flavour by the addition of sugar.

Fruit syrups may be used as a cordial or as a sauce to be used for ice cream and sweets, or they may be made into a jelly by the addition of gelatine (1 desertspoonful to ½ pint liquid). The juices may also be used in milk shakes.

AMOUNT OF SUGAR FOR FRUIT SYRUP.

| | |
|---|---|
| Berry Fruits | 2 cups sugar to 3 cups juice. |
| Orange-Grapefruit | 1 cup sugar to 3 cups juice. |
| Lemon | 1 cup sugar to 1 cup juice. |
| Plums | 1 cup sugar to 2 cups juice. |
| Pineapple | 1 cup sugar to 1 cup juice. |

AMOUNT OF SUGAR FOR FRUIT JUICES.

Apples, grapes, oranges, and tomatoes do not need the addition of sugar. Citrus juice may have sugar added at time of serving.

| | |
|---|---|
| Berries | 1 cup sugar to 9 cups juice. |
| Cherries | 1 cup sugar to 9 cups juice. |
| Plums | 1 cup sugar to 4 cups juice. |
| Pineapple | 1 cup sugar to 9 cups juice. |
| Citrus Fruits (Lemon, Grape-fruit) | 1 cup sugar to 9 cups juice. |

The sugar should be added to the freshly extracted juice and stirred over the fire until the sugar is dissolved. Remove immediately.

### *Processing*

Thoroughly wash the bottles in hot water and boil the corks for ten minutes.

Fill the bottles with the juice to within ¼ inch from the top. Rest corks or lids loosely on the tops of the bottles or jars and place on the stand in the sterilizer. Add sufficient warm water to reach the necks of the bottles, cover the vessel with the lid and raise the temperature of the water to 170° F. to 180° F. Maintain this temperature for 30 minutes. If a thermometer is not available the water should be barely simmering for the duration of the processing.

At the end of the processing time, remove the bottles, adjust the tops and seal as quickly as possible. If corks are used this is done by inverting the bottles in melted paraffin or candle grease so that the top of the bottle is completely covered with wax.

Store the jars or bottles in a cool dark place free from moisture so that the juice will retain its fresh flavour.

# Standard Herd Records

## For Quarter ended 30th September, 1945.

In the following are set out the records of all cows which completed a lactation during the quarter. The number is 546, of which 351 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies with the age class to which the animal belongs, the standard being as follows:—

| | |
|---|---|
| Junior 2-year old (under 2½ years at time of calving) .. .. | 230 lb. butter-fat. |
| Senior 2-year old (between 2½ and 3 years at time of calving) .. | 250 lb. butter-fat. |
| Junior 3-year old (between 3 and 3½ years at time of calving) .. | 270 lb. butter-fat. |
| Senior 3-year old (between 3½ and 4 years at time of calving) .. | 290 lb. butter-fat. |
| Junior 4-year old (between 4 and 4½ years at time of calving) .. | 310 lb. butter-fat. |
| Senior 4-year old (between 4½ and 5 years at time of calving) .. | 330 lb. butter-fat. |
| Mature cow 5 years and over .. .. .. .. .. | 350 lb. butter-fat. |

N.C.K. denotes no chart kept.

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Atkinson, W. K., Swan Hill, Dairy Shorthorn (33).** | | | | | | | | | | |
| Willow Park Blush 10th .. | 1641D | 273 | 25½ | 14,484 | 3·75 | 542·1 | 350 | Mature | 352, 364, 409, 486, 447 | Wicklesham Lord Barrington 5th (Imp.) |
| Willow Park Blush 17th .. | 2241C | 180 | 4 | 4,605 | 3·35 | 154·4 | 310 | Jr. 4 | 323, 310 .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Blush 19th .. | 2242C | 210 | 4 | 5,910 | 3·66 | 216·4 | 270 | Jr. 3 | 277 .. | Willow Park Barrington 77th |
| Willow Park Blush 21st .. | 2244C | 210 | 4 | 5,475 | 3·24 | 177·4 | 270 | Jr. 3 | 231 .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Blush 24th .. | 2246C | 273 | 27 | 9,246 | 3·77 | 349·0 | 230 | Jr. 2 | .. .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Camelia 18th | 524D | 273 | 37 | 13,838 | 3·53 | 488·0 | 350 | Mature | 332, 423, 456, 470, 510, 551 | Wicklesham Lord Barrington 5th (Imp.) |
| Willow Park Comet 30th .. | 2253C | 240 | 4 | 6,045 | 4·07 | 246·0 | 310 | Jr. 4 | 255, 198 .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Countess 32nd | 1663D | 240 | 4 | 9,375 | 3·69 | 346·2 | 350 | Mature | 314, 270, 240, 238 | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Countess 51st | 2333D | 273 | 17½ | 7,611 | 3·68 | 280·2 | 230 | Jr. 2 | .. .. | Willow Park Royal Barrington |
| Willow Park Crocus 2nd .. | 2043E | 273 | 9½ | 8,022 | 3·65 | 292·7 | 350 | Mature | 267, 262, 286 | Willow Park Barrington 51st |
| Willow Park Dainty 14th.. | 1667D | 273 | 17½ | 13,493 | 3·67 | 494·9 | 350 | Mature | 301, 313, 409, 411, 463, 454 | Wicklesham Lord Barrington 5th (Imp.) |
| Willow Park Dainty 22nd.. | 2262C | 210 | 4 | 5,985 | 3·43 | 205·0 | 270 | Jr. 3 | 225 .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Damsel 18th | 2338D | 273 | 13 | 8,067 | 3·36 | 271·2 | 270 | Jr. 3 | 246 .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Duchess 28th | 543D | 273 | 10 | 10,262 | 3·40 | 348·4 | 350 | Mature | 239, 302, 396, 387, 446, 317, 331, 334 | Wicklesham Lord Barrington 5th (Imp.) |
| Willow Park Duchess 33rd | 1670D | 273 | 14½ | 11,322 | 4·02 | 455·0 | 350 | Mature | 335, 365, 435, 428, 511, 535 | Wicklesham Lord Barrington 5th (Imp.) |
| Willow Park Duchess 35th | 1671D | 273 | 30 | 16,912 | 3·56 | 601·7 | 350 | Mature | 263, 429, 503, 691, 560 | Wicklesham Lord Barrington 5th (Imp.) |
| Willow Park Duchess 59th | 2341D | 273 | 12½ | 9,363 | 3·66 | 343·1 | 270 | Jr. 3 | 325 .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Duchess 60th | 2269C | 273 | 17 | 7,416 | 3·59 | 265·9 | 270 | Jr. 3 | 266 .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Duchess 64th | 2270C | 273 | 16½ | 8,106 | 3·40 | 275·2 | 230 | Jr. 2 | .. .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Duchess 65th | 2271C | 273 | 12 | 5,543 | 4·38 | 242·8 | 230 | Jr. 2 | .. .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Melba 15th.. | 1315E | 273 | 19 | 9,240 | 4·05 | 374·3 | 350 | Mature | 414, 426, 446, 460, 484, 529, 444, 421 | Willow Park Lustre 3rd |
| Willow Park Melba 25th .. | 554D | 273 | 6½ | 7,565 | 3·74 | 283·2 | 350 | Mature | 282, 377, 503, 408, 433, 323 | Wicklesham Lord Barrington 5th (Imp.) |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Atkinson, W. K., Swan Hill, Dairy Shorthorn—*continued*** | | | | | | | | | | |
| Willow Park Melba 27th .. | 556D | 273 | 20 | 10,805 | 3·77 | 407·0 | 350 | Mature | 301, 376, 394, 418, 420, 337 | Wicklesham Lord Barrington 5th (Imp.) |
| Willow Park Melba 43rd .. | 2276C | 273 | 10 | 7,279 | 3·11 | 226·1 | 310 | Jr. 4 | 275 .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Moss Rose 17th | 1692D | 273 | 10 | 7,732 | 3·90 | 301·8 | 350 | Mature | 333, 306, 335, 301 | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Moss Rose 18th | 1693D | 240 | 4 | 8,662 | 3·69 | 320·0 | 350 | Mature | 318, 376, 382, 330 | Wicklesham Lord Barrington 5th (Imp.) |
| Willow Park Moss Rose 27th | 2190B | 240 | 4 | 5,715 | 2·92 | 167·0 | 270 | Jr. 3 | 298 .. | Willow Park Barrington 77th |
| Willow Park Moss Rose 31st | 2191B | 273 | 31 | 8,535 | 3·49 | 297·9 | 250 | Sr. 2 | .. .. | Willow Park Royal Barrington |
| Willow Park Moss Rose 32nd | 2348D | 273 | 19½ | 7,607 | 4·01 | 305·4 | 230 | Jr. 2 | .. .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Red Rose 3rd | 2159A | 240 | 4 | 6,405 | 3·43 | 219·8 | 270 | Jr. 3 | 211 .. | Willow Park Barrington 77th |
| Willow Park Red Rose 4th | 2160A | 273 | 11 | 6,738 | 3·41 | 230·0 | 230 | Jr. 2 | .. .. | Willow Park Barrington 77th |
| Willow Park Rosebud .. | 243A | 273 | 4½ | 6,014 | 3·27 | 196·9 | 350 | Mature | 241, 273, 179, 202, 230, 219, 175 | Steventon Forester |
| Willow Park Rosette .. | 2165A | 273 | 7½ | 7,014 | 2·65 | 185·6 | 270 | Jr. 3 | 230 .. | Anderson Imperial Cran 6th (Imp.) |
| **Ballarat Orphanage, Ballarat, Jersey (13).** | | | | | | | | | | |
| Latrobe Andante 11th .. | 82357 | 273 | N.C.K. | 8,797 | 5·00 | 439·5 | 330 | Sr. 4 | 306, 353 .. | Banyule Mollison |
| Orphanage Attraction 15th | Vol. 31 | 273 | N.C.K. | 4,625 | 5·12 | 237·0 | 350 | Mature | 413, 412 .. | Banyule Terraplane |
| Orphanage Attraction 21st | Vol. 31 | 273 | N.C.K. | 7,369 | 4·87 | 359·2 | 250 | Sr. 2 | 246 .. | Clarendon Eyre Lililite's Oxford 4th |
| Orphanage Attraction 22nd | Vol. 33 | 243 | 4 | 5,097 | 5·13 | 261·6 | 230 | Jr. 2 | .. .. | Banyule Terraplane |
| Orphanage Gipsy .. | C.R. | 252 | N.C.K. | 4,233 | 5·34 | 226·0 | 230 | Jr. 2 | .. .. | Clarendon Eyre Lililite's Oxford 4th |
| Orphanage Lady Jean .. | 83291 | 273 | N.C.K. | 5,657 | 5·52 | 312·3 | 350 | Mature | 327, 380, 349 | Tavistock Quality Lad |
| Orphanage Melba 23rd .. | Vol. 31 | 248 | 4 | 5,440 | 5·05 | 274·9 | 250 | Sr. 2 | .. .. | Banyule Terraplane |
| Orphanage Pearl 18th .. | Vol. 33 | 273 | N.C.K. | 4,219 | 4·71 | 198·9 | 230 | Jr. 2 | .. .. | Clarendon Eyre Lililite's Oxford 4th |
| Orphanage Quicksand 22nd | Vol. 33 | 273 | N.C.K. | 4,814 | 5·08 | 244·7 | 230 | Jr. 2 | .. .. | Clarendon Eyre Lililite's Oxford 4th |
| Orphanage Silvermine 6th | Vol. 33 | 273 | N.C.K. | 3,753 | 5·83 | 218·8 | 230 | Jr. 2 | .. .. | Banyule Gull |
| Orphanage Tiddlewinks 2nd | Vol. 31 | 273 | N.C.K. | 5,640 | 5·25 | 296·0 | 270 | Jr. 3 | .. .. | Clarendon Eyre Lililite's Oxford 4th |
| Orphanage Zaffarine 16th.. | Vol. 31 | 273 | N.C.K. | 4,969 | 5·34 | 265·1 | 270 | Jr. 3 | .. .. | Banyule Air Lock |
| Tobermory Sapper's Seville | Vol. 31 | 273 | N.C.K. | 6,695 | 5·27 | 352·8 | 350 | Mature | 322, 327 .. | Orphanage V. C. Sapper |
| **Banyule Stud, Wangaratta, Jersey (2).** | | | | | | | | | | |
| Banyule Silvermine 136th.. | 75075 | 180 | 4 | 3,840 | 5·09 | 195·4 | 330 | Sr. 4 | 303, 319 .. | Tavistock Honesty's Prince 2nd |
| Kintore Victory Rita ... | Vol. 31 | 180 | 4 | 3,540 | 4·38 | 155·2 | 270 | Jr. 3 | 282 .. | Kintore Northern King |
| **Barker, Mrs. E. M., Richardson, G. H. T., and Hornsby, F. C., Vervale, Jersey (5).** | | | | | | | | | | |
| Bank Meadows Curio .. | Vol. 32 | 273 | N.C.K. | 5,639 | 5·22 | 294·5 | 230 | Jr. 2 | .. .. | Hylsbroke Air Pilot |
| Bank Meadows Token 2nd | Vol. 32 | 273 | N.C.K. | 6,191 | 5·26 | 325·4 | 330 | Jr. 2 | .. .. | Wonga Park Eri King |
| Bank Meadows Violet .. | Vol. 31 | 273 | N.C.K. | 6,516 | 5·15 | 335·3 | 270 | Jr. 3 | .. .. | Ardleigh Prince Chut |
| Coral Vale Nanette .. | Vol. 33 | 273 | N.C.K. | 8,486 | 4·33 | 380·7 | 230 | Jr. 2 | .. .. | Glenone Airman 2nd |
| Merrilyn Souvenir .. | 82803 | 273 | N.C.K. | 6,767 | 4·60 | 311·6 | 350 | Mature | .. .. | Merrilyn Observer |
| **Bennett, J. W., Yinnar, Jersey (1).** | | | | | | | | | | |
| Ellendale Cloudy 9th .. | Vol. 31 | 273 | N.C.K. | 7,224 | 5·71 | 412·4 | 310 | Jr. 4 | 393, 385 .. | Staghorn Bellboy |
| **Bennett, R. H., and Sons, Lancefield, Jersey (2).** | | | | | | | | | | |
| Edenhope Audrey .. | Vol. 31 | 273 | 11 | 4,760 | 5·24 | 249·2 | 270 | Jr. 3 | .. .. | Jindivick Defiance |
| Edenhope Madeira .. | 57121 | 273 | 14 | 6,617 | 6·05 | 400·5 | 350 | Mature | 418, 457, 455, 500 | Rosyth Wee Macgregor |
| **Black, Estate of the late I. S., Noorat, Ayrshire (2).** | | | | | | | | | | |
| Mount Noorat Alert 11th.. | 33887 | 180 | 4 | 3,240 | 4·35 | 140·8 | 350 | Mature | 288, 206, 314 | Gowrie Park Scottish Patron |
| Mount Noorat Maskah .. | 34882 | 273 | 18 | 8,107 | 4·78 | 387·4 | 290 | Sr. 3 | 275, 302 .. | Sandhill Kipling (Imp.) |
| **Broad, Mrs. A. A., Sutton Grange, Jersey (7).** | | | | | | | | | | |
| Grangelea Begonia .. | 76588 | 273 | 16 | 6,616 | 4·83 | 319·4 | 350 | Mature | 264, 338, 340 | Grangelea Butter Boy 5th |
| Grangelea Bella 2nd .. | Vol. 31 | 273 | 17 | 5,612 | 5·02 | 281·7 | 230 | Jr. 2 | .. .. | Navua Wonderful Count |
| Grangelea Damsel 6th .. | 66753 | 273 | 14 | 4,662 | 6·13 | 285·7 | 350 | Mature | 326, 366, 370, 362, 335 | Grangelea Roderick 2nd |
| Grangelea Romance 2nd .. | Vol. 31 | 273 | 14 | 4,646 | 5·06 | 235·2 | 230 | Jr. 2 | .. .. | Navua Wonderful Count |
| Grangelea Ruby 4th .. | Vol. 31 | 273 | 14 | 5,001 | 5·10 | 255·0 | 230 | Jr. 2 | .. .. | Grangelea Prince 2nd |
| Grangelea Velvetation .. | 81599 | 273 | 13½ | 4,826 | 5·86 | 283·0 | 310 | Jr. 4 | 260, 323 .. | Grangelea Roderick 2nd |
| Grangelea Vida .. .. | 76594 | 273 | 16 | 6,243 | 5·16 | 322·4 | 350 | Mature | 296, 292, 322 | Banyule Upcast |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk last day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Broad, A. J., Pyramid, Jersey (2).** | | | | | | | | | | |
| Lynlea Mayflower 2nd | Vol. 31 | 273 | N.C.K. | 5,163 | 5·81 | 299·8 | 270 | Jr. 3 | 267 .. | Grangelea Max |
| Lynlea Pearlette .. | Vol. 31 | 273 | N.C.K. | 4,539 | 5·55 | 252·1 | 270 | Jr. 3 | 199 .. | Grangelea Robert 3rd |
| **Bruhn, C. H., Mirboo North, Jersey (4).** | | | | | | | | | | |
| Eltekon Queen's Guide .. | Vol. 31 | 240 (Sold) | .. | 4,410 | 6·04 | 266·4 | 310 | Jr. 4 | 239 .. | Silverbrae Volunteer |
| Lauriston Bonny Belle 3rd | 87385 | 273 | N.C.K. | 6,164 | 5·28 | 325·7 | 310 | Jr. 4 | .. .. | Werribee Grandee |
| Lauriston Northern Belle 4th | 87389 | 273 | N.C.K. | 7,115 | 4·93 | 350·9 | 290 | Sr. 3 | 291 .. | Werribee Grandee |
| Lauriston Northern Princess 2nd | 72369 | 240 (Sold) | .. | 6,165 | 5·11 | 315·0 | 350 | Mature | 302, 325, 329 | Werribee Grandee |
| **Butcher, F. T., Swan Hill, Red Poll (12).** | | | | | | | | | | |
| Maryville Bonnie .. | Vol. 13 | 273 | N.C.K. | 6,071 | 3·97 | 241·0 | 230 | Jr. 2 | .. .. | Victoria Chase |
| Maryville Ella .. | 5898A | 273 | N.C.K. | 7,110 | 3·99 | 283·6 | 350 | Mature | 303, 340, 274, 444, 397, 426, 474 | Chandpara Ferdinand |
| Maryville Elma .. | 9000A | 210 | N.C.K. | 4,935 | 4·42 | 217·9 | 310 | Jr. 4 | 233, 295 .. | Victoria Generator B |
| Maryville Elva .. | 3722A | 273 | N.C.K. | 5,669 | 4·02 | 227·9 | 350 | Mature | 304, 402, 356, 400, 239, 437, 419, 323, 340 | Victoria King Bird |
| Maryville Eva .. | Vol. 13 | 273 | N.C.K. | 6,408 | 4·45 | 285·4 | 230 | Jr. 2 | .. .. | Victoria Chase |
| Maryville Fancy .. | 7863A | 273 | N.C.K. | 7,805 | 3·90 | 304·4 | 330 | Sr. 4 | 226, 285, 300 | Victoria Generator B |
| Maryville Fay .. | 6910A | 240 | N.C.K. | 6,810 | 4·04 | 275·3 | 350 | Mature | 218, 290, 343, 349, 382 | Temperley Prism |
| Maryville Florence .. | Vol. 13 | 240 | N.C.K. | 4,485 | 4·86 | 217·8 | 230 | Jr. 2 | .. .. | Victoria Chase |
| Maryville Ideal .. | Vol. 13 | 273 | N.C.K. | 5,042 | 4·51 | 227·5 | 230 | Jr. 2 | .. .. | Victoria Chase |
| Maryville Miranda .. | 9229B | 273 | N.C.K. | 7,616 | 4·33 | 329·4 | 270 | Jr. 3 | 293 .. | Victoria Generator B |
| Maryville Olga .. | 8022C | 273 | 5 | 8,190 | 3·93 | 322·1 | 350 | Mature | 342, 350, 335 | Victoria Generator B |
| Maryville Rosalene .. | 9253C | 240 | N.C.K. | 6,660 | 4·19 | 279·1 | 270 | Jr. 3 | 286 .. | Victoria Generator B |
| **Candler, G. E., Hamilton, Ayrshire (1).** | | | | | | | | | | |
| Jennewar Joyce .. | 36452 | 240 | 4 | 4,140 | 3·93 | 162·8 | 290 | Sr. 3 | 263 .. | Inverurie Lauchie |
| **Carne, W. J., Pakenham Upper, Jersey (3).** | | | | | | | | | | |
| Glencarne Song's Harmony | Vol. 32 | 273 | N.C.K. | 6,821 | 5·82 | 397·0 | 230 | Jr. 2 | .. .. | Wonga Park Ace High |
| Wonga Park Songbird .. | 74607 | 273 | N.C.K. | 9,753 | 5·55 | 541·3 | 350 | Mature | 404, 437, 491, 533, 449 | Wonga Park Minx's Ace |
| Wonga Park Standard Rose | 89696 | 273 | N.C.K. | 6,630 | 6·06 | 401·5 | 310 | Jr. 4 | 371, 338 .. | Brampton Noble Standard (Imp.) |
| **Central Methodist Mission, Lilydale, Guernsey (1).** | | | | | | | | | | |
| Tally Ho Golden Locks .. | 11632 | 273 | 10½ | 5,522 | 4·47 | 246·8 | 330 | Sr. 4 | 285, 270, 331 | Yarraview Fakir |
| **Chirnside, R. M., Whittlesea, Jersey (3).** | | | | | | | | | | |
| Mornmoot Fancy Starbright 8th | 77850 | 273 | 14½ | 8,399 | 5·84 | 490·3 | 310 | Jr. 4 | 369, 456 .. | Werribee Laverock |
| Mornmoot Mimi .. .. | 58567 | 273 | 15 | 7,862 | 5·29 | 415·8 | 350 | Mature | 413, 542, 610, 660, 570, 486 | War Valour (Imp.) |
| Mornmoot Satisfaction 9th | 77856 | 273 | 14½ | 7,626 | 5·55 | 423·3 | 290 | Sr. 3 | 338, 414 .. | Werribee Laverock |
| **Clarke, F. W., Toora, Jersey (3).** | | | | | | | | | | |
| Mer Vue Choice Soprano 8th | C.R. | 273 | N.C.K. | 4,719 | 6·51 | 307·2 | 270 | Jr. 3 | .. .. | Mer Vue Jupiter |
| Mer Vue Choice Warbler .. | Vol. 31 | 273 | N.C.K. | 4,653 | 6·36 | 296·4 | 230 | Jr. 2 | .. .. | Mer Vue Jupiter |
| Mer Vue Wee Doris 2nd .. | 77707 | 273 | N.C.K. | 7,740 | 5·51 | 426·4 | 350 | Mature | 312, 371, 420 | Mer Vue Student Lad |
| **Clark, P. W. and Son, Whittlesea, Jersey (8).** | | | | | | | | | | |
| Coodardy Fancy Starbright | Vol. 32 | 273 | 15 | 5,760 | 4·93 | 283·8 | 230 | Jr. 2 | .. .. | Navua Paxie's Volunteer |
| Coodardy Gloria's Maid .. | 85711 | 273 | 16½ | 7,265 | 4·97 | 361·4 | 270 | Jr. 3 | 365 .. | Brucevale Lord Rupert |
| Coodardy Golden's Glorious | Vol. 32 | 273 | 12½ | 5,468 | 6·12 | 334·8 | 230 | Jr. 2 | .. .. | Mornmoot Clementine's Golden |
| Coodardy Rupert's Annette 3rd | 85716 | 273 | 6 | 5,718 | 5·87 | 335·7 | 290 | Sr. 3 | 368 .. | Brucevale Lord Rupert |
| Mornmoot Clementine 9th | 63196 | 273 | 4½ | 6,074 | 4·33 | 262·9 | 350 | Mature | 425, 465, 505, 380 | Werribee Warrior |
| Mornmoot Northwood | 77853 | 273 | 12 | 7,958 | 5·28 | 420·3 | 310 | Jr. 4 | 375, 438 .. | War Valour (Imp.) |
| Mornmoot Madeira 13th | 89339 | 273 | 15 | 6,465 | 5·91 | 382·3 | 310 | Jr. 4 | 405, 347 .. | Werribee Centurion |
| Toorongo Chevy .. .. | 79583 | 273 | 18 | 8,264 | 6·45 | 532·7 | 310 | Jr. 4 | 326 .. | Werribee Rex |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Colenso, L. W. R., Alvie, Jersey (6).** | | | | | | | | | | |
| Normandie Alsyke 4th .. | 73201 | 273 | 12 | 7,619 | 5·07 | 386·0 | 350 | Mature | 262, 391, 459, 436 | Lewisham Playboy |
| Normandie Alsyke 5th .. | 88268 | 273 | 14 | 7,635 | 3·87 | 295·2 | 350 | Mature | 314, 280 .. | Normandie Playmate |
| Normandie Alsyke 9th .. | Vol. 31 | 273 | 17 | 6,401 | 5·44 | 348·5 | 230 | Jr. 2 | .. .. | Normandie Jolly Boy |
| Normandie Hawthorn 29th | Vol. 33 | 273 | 9 | 3,649 | 4·99 | 182·2 | 230 | Jr. 2 | .. .. | Normandie Jolly Boy |
| Normandie Ilma 4th .. | 58745 | 273 | 17 | 7,598 | 5·23 | 397·0 | 350 | Mature | 247, 302, 406, 487, 518, 496 | Normandie Majestic |
| Normandie Ilma 5th .. | 58746 | 273 | 21 | 8,648 | 5·00 | 432·7 | 350 | Mature | 227, 265, 478, 452, 474 | Normandie Majestic |
| **Cook, D. E., Loch, Jersey (1).** | | | | | | | | | | |
| Wattle Vale Starbright .. | 64843 | 273 | N.C.K. | 6,650 | 4·31 | 286·4 | 350 | Mature | 375, 283 .. | Ewelme Eileen's Northerner |
| **Coulthard, J. J., Whittlesea, Jersey (7).** | | | | | | | | | | |
| Walamba Bonnie ... | 89487 | 210 (Sold) | .. | 4,920 | 4·79 | 235·7 | 350 | Mature | 243, 218 .. | Airlie Don |
| Walamba Claribelle .. | 89488 | 273 | N.C.K. | 5,155 | 5·30 | 273·4 | 290 | Sr. 3 | 279 .. | Airlie Don |
| Walamba Lady Balsom .. | Vol. 31 | 273 | N.C.K. | 4,070 | 6·00 | 244·2 | 270 | Jr. 3 | 229 .. | The Wattles Petal's Gamboge 3rd |
| Walamba Nellie Grey .. | 84427 | 251 | N.C.K. | 4,123 | 5·56 | 229·1 | 350 | Mature | 359, 250, 289 | Airlie Don |
| Walamba Princess Grey .. | Vol. 32 | 273 | N.C.K. | 3,395 | 5·16 | 175·7 | 310 | Jr. 4 | 249 .. | Airlie Don |
| Walamba Rosabel .. | Vol. 33 | 273 | N.C.K. | 4,912 | 4·66 | 229·0 | 230 | Jr. 2 | .. .. | The Wattles Petal's Gamboge 3rd |
| Walamba Rosebud .. | Vol. 32 | 273 | N.C.K. | 3,892 | 4·38 | 170·5 | 250 | Sr. 2 | 147 .. | The Wattles Petal's Gamboge 3rd |
| **Cowan, G. L. S., Bacchus Marsh, Friesian (12).** | | | | | | | | | | |
| Ingolston Peeress .. | 4732 | 273 | N.C.K. | 9,294 | 3·87 | 359·3 | 350 | Mature | 465, 431, 364, 350 | Cordyline Cremona Pontiac |
| Upper Lappan Beauty .. | Vol. 15 | 273 | N.C.K. | 9,450 | 3·62 | 342·5 | 310 | Jr. 4 | 360 .. | Upper Lappan Pontiac |
| Upper Lappan Blindy .. | C.R. | 273 | N.C.K. | 7,064 | 3·45 | 243·8 | 250 | Sr. 2 | .. .. | Upper Lappan Pontiac |
| Upper Lappan Dandy .. | Vol. 15 | 273 | N.C.K. | 8,883 | 3·55 | 315·6 | 310 | Jr. 4 | 276 .. | Upper Lappan Pontiac |
| Upper Lappan Duchess .. | 6068 | 273 | N.C.K. | 19,263 | 4·07 | 783·3 | 350 | Mature | 432, 445, 465, 521 | Polygon Bell's Springfield |
| Upper Lappan Edna .. | 6069 | 273 | N.C.K. | 10,701 | 3·49 | 373·3 | 350 | Mature | 316, 378, 403, 426 | Elgin Glen Segis |
| Upper Lappan Mayfield .. | Vol. 15 | 273 | N.C.K. | 12,339 | 3·51 | 433·3 | 350 | Mature | 280, 363, 392 | Upper Lappan Pontiac |
| Upper Lappan Ollie .. | Vol. 15 | 273 | N.C.K. | 10,166 | 2·93 | 297·8 | 350 | Mature | 267, 350, 395, 407 | Elgin Glen Segis |
| Upper Lappan Princess 2nd | C.R. | 273 | N.C.K. | 5,930 | 3·49 | 206·7 | 230 | Jr. 2 | .. .. | Lerderderg Top Gallant |
| Upper Lappan Shepherdess 2nd | C.R. | 273 | N.C.K. | 6,590 | 3·52 | 232·2 | 230 | Jr. 2 | .. .. | Lerderderg Top Gallant |
| Upper Lappan Snowdrop .. | Vol. 15 | 273 | N.C.K. | 9,252 | 3·49 | 322·7 | 290 | Sr. 3 | 270 .. | Upper Lappan Pontiac |
| Upper Lappan Snowflake .. | Vol. 15 | 273 | N.C.K. | 9,933 | 3·57 | 354·6 | 290 | Sr. 3 | 275 .. | Upper Lappan Pontiac |
| **Dennis, Mrs. A. A., Frankston, Jersey (6).** | | | | | | | | | | |
| Ballam Gaylark .. .. | Vol. 31 | 273 | 20 | 5,498 | 5·87 | 322·6 | 230 | Jr. 2 | .. .. | Windrest Gadget's Achievement |
| Ballam Lilac's Dream .. | 80090 | 273 | 18½ | 6,691 | 6·00 | 401·5 | 310 | Jr. 4 | 398, 443 .. | Ballam Preference |
| Ballam Mary's Matilda .. | Vol. 31 | 273 | 14½ | 6,027 | 6·20 | 373·6 | 230 | Jr. 2 | .. .. | Windrest Gadget's Achievement |
| Jubilee Ambercane .. | Vol. 32 | 273 | 8 | 3,656 | 6·35 | 232·1 | 230 | Jr. 2 | .. .. | Jubilee Lunarlight |
| Jubilee Lepidodendron .. | Vol. 32 | 273 | 12 | 5,667 | 6·17 | 349·5 | 230 | Jr. 2 | .. .. | Jubilee Richlight |
| Jubilee Lint .. .. | Vol. 32 | 273 | 15 | 5,715 | 4·97 | 283·9 | 230 | Jr. 2 | .. .. | Jubilee Lunarlight |
| **Department of Agriculture, Burnley, Jersey (2).** | | | | | | | | | | |
| Victoria Princess Betty .. | 59873 | 273 | 18 | 8,771 | 4·79 | 420·3 | 350 | Mature | 429, 456, 496, 361, 350, 391 | Selsey Viola's Boy |
| Victoria Flirting Princess .. | 74373 | 273 | 20 | 6,270 | 7·21 | 452·1 | 350 | Mature | 328, 339, 345 | Selsey Spotted Prince |
| **Department of Agriculture, Werribee, Friesian (5).** | | | | | | | | | | |
| Victoria Belle .. .. | 6075 | 240 | 4 | 12,825 | 3·07 | 393·5 | 350 | Mature | 344, 456, 378, 562 | Rupertswood Inka Jo |
| Victoria Chorette .. | C.R. | 273 | 30 | 9,750 | 2·97 | 289·2 | 230 | Jr. 2 | .. .. | Terling Hypothesis (Imp.) |
| Victoria Ilkaling .. .. | Vol. 15 | 273 | 10½ | 8,830 | 3·74 | 330·3 | 250 | Sr. 2 | 277 .. | Terling Hypothesis (Imp.) |
| Victoria Josling .. .. | Vol. 15 | 273 | 26 | 11,133 | 3·28 | 365·2 | 270 | Jr. 3 | 414 .. | Terling Hypothesis (Imp.) |
| Victoria Rita .. .. | 6097 | 273 | 16½ | 15,059 | 3·10 | 466·7 | 350 | Mature | 285, 468, 575, 429, 602 | Rupertswood Inka Jo |
| **Department of Agriculture, Werribee, Red Poll (28).** | | | | | | | | | | |
| Victoria Auxiliary .. | 7954A | 210 (Sold) | .. | 4,935 | 4·52 | 223·3 | 350 | Mature | 278, 322, 392 | Woodburn Peter Pan |
| Victoria Beadly .. .. | 8715AA | 273 | N.C.K. | 6,419 | 4·22 | 271·2 | 270 | Jr. 3 | 340 .. | Burnwood Masterpiece |
| Victoria Bell Ring .. | C.R. | 273 | 6 | 5,479 | 4·35 | 238·5 | 230 | Jr. 2 | .. .. | Woodburn Peter Pan |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Department of Agriculture, Werribee, Red Poll—*continued.*** | | | | | | | | | | |
| Victoria Bodikin .. | 7010A | 273 | 12 | 9,186 | 3·83 | 351·7 | 350 | Mature | 277, 357, 465, 384, 411 | Victoria Goblin |
| Victoria Checky .. .. | 9136A | 246 | 4 | 5,787 | 4·20 | 243·0 | 330 | Sr. 4 | 360, 295 .. | Woodburn Peter Pan |
| Victoria Easter .. | 9140A | 273 | 20 | 7,899 | 4·05 | 320·0 | 330 | Sr. 4 | 273, 375 .. | Victoria Petrology |
| Victoria Forelady .. | 9142A | 273 | N.C.K. | 6,437 | 3·58 | 230·4 | 330 | Sr. 4 | 264, 317 .. | Burnwood Masterpiece |
| Victoria Glorious .. | 8718AA | 273 | 5 | 8,851 | 4·63 | 409·5 | 310 | Jr. 4 | 338, 409 .. | Burnwood Masterpiece |
| Victoria Glory .. .. | Vol. 13 | 273 | 17 | 7,937 | 4·03 | 319·8 | 250 | Sr. 2 | .. .. | Burnwood Masterpiece |
| Victoria Humour.. .. | 9147A | 273 | N.C.K. | 5,909 | 3·77 | 222·8 | 270 | Jr. 3 | 281 .. | Woodburn Peter Pan |
| Victoria Jane .. .. | 9148A | 273 | 12 | 9,344 | 4·30 | 402·1 | 350 | Mature | 336, 376, 412 | Woodburn Peter Pan |
| Victoria Janet .. .. | 9149A | 273 | N.C.K. | 7,303 | 4·46 | 325·6 | 330 | Sr. 4 | 356, 430 .. | Burnwood Masterpiece |
| Victoria Jazz .. .. | 9150A | 273 | 17 | 8,013 | 3·95 | 316·5 | 270 | Jr. 3 | 357 .. | Burnwood Masterpiece |
| Victoria Maid .. .. | 8720AA | 273 | 20 | 7,758 | 4·30 | 333·6 | 290 | Sr. 3 | 349 .. | Victoria Petrology |
| Victoria Marie .. .. | 9151A | 273 | 15 | 10,392 | 3·64 | 378·3 | 310 | Jr. 4 | 349, 389 .. | Burnwood Masterpiece |
| Victoria Mary Rose .. | 6711AA | 273 | 18 | 9,115 | 4·13 | 376·9 | 350 | Mature | 319, 436, 457, 233, 432 | Chandpara Valentine |
| Victoria Miss Maid .. | 9152A | 273 | 14 | 6,442 | 4·39 | 283·0 | 230 | Jr. 2 | .. .. | Victoria Petrology |
| Victoria Mountain .. | 7965A | 273 | 19 | 7,382 | 4·25 | 313·7 | 350 | Mature | 267, 448, 344 | Woodburn Peter Pan |
| Victoria Pan Velvet .. | 7586AA | 273 | 14 | 7,919 | 4·25 | 336·2 | 350 | Mature | 409, 438, 318, 359 | Woodburn Peter Pan |
| Victoria Pearl .. .. | C.R. | 273 | 23 | 7,057 | 4·31 | 304·0 | 230 | Jr. 2 | .. .. | Burnwood Masterpiece |
| Victoria Persephone .. | 9214B | 273 | 14 | 8,595 | 4·27 | 366·8 | 350 | Mature | 412, 334, 238 | Woodburn Peter Pan |
| Victoria Phonette .. | C.R. | 240 (Sold) | .. | 6,435 | 3·75 | 241·4 | 230 | Jr. 2 | .. .. | Burnwood Masterpiece |
| Victoria Rebeller .. | C.R. | 273 | 4½ | 5,009 | 4·89 | 245·0 | 270 | Jr. 3 | 248 .. | Victoria Petrology |
| Victoria Storm .. .. | Vol. 13 | 273 | 25 | 8,522 | 4·26 | 363·1 | 250 | Sr. 2 | .. .. | Woodburn Peter Pan |
| Victoria Surge .. .. | C.R. | 273 | 16 | 7,401 | 4·31 | 319·1 | 230 | Jr. 2 | .. .. | Burnwood Masterpiece |
| Victoria Trojah .. .. | Vol. 13 | 273 | 19½ | 8,490 | 4·25 | 360·8 | 250 | Sr. 2 | .. .. | Burnwood Masterpiece |
| Victoria Welcome .. | Vol. 13 | 273 | 18 | 6,837 | 4·17 | 285·4 | 230 | Jr. 2 | .. .. | Woodburn Peter Pan |
| Victoria Whirlie .. .. | Vol. 13 | 273 | 8 | 7,659 | 3·98 | 304·5 | 270 | Jr. 3 | 331 .. | Woodburn Peter Pan |
| **Desmond, J. J., Rochester, Jersey (11).** | | | | | | | | | | |
| Macroom Edna's Lassie .. | 82587 | 247 | 4 | 7,627 | 5·70 | 435·0 | 350 | Mature | 429, 408, 441 | Macroom Lassie's Mikado |
| Macroom Ellen 8th .. | 62883 | 273 | N.C.K. | 8,762 | 5·16 | 451·9 | 350 | Mature | 489, 385 .. | Macroom Fern Lad |
| Macroom Lovebird 6th .. | 87609 | 273 | N.C.K. | 8,912 | 5·98 | 533·0 | 350 | Mature | 479 .. | Clifford Farm Robin Adair |
| Macroom Mary 3rd .. | Vol. 31 | 273 | N.C.K. | 7,575 | 5·90 | 447·1 | 270 | Jr. 3 | 452 .. | Macroom Skipper |
| Macroom Mary 4th .. | Vol. 32 | 273 | N.C.K. | 6,269 | 5·92 | 370·9 | 230 | Jr. 2 | .. .. | Clifford Farm Robin Adair |
| Macroom Mary 5th .. | Vol. 32 | 273 | N.C.K. | 6,132 | 5·50 | 337·4 | 230 | Jr. 2 | .. .. | Macroom Fairy's Adair |
| Macroom Pegg's Lily .. | C.R. | 247 (Sold) | .. | 5,505 | 5·13 | 282·4 | 290 | Sr. 3 | 288 .. | Macroom Robin Adair |
| Macroom Perrec's Lassie 2nd | C.R. | 273 | N.C.K. | 6,095 | 5·53 | 336·8 | 230 | Jr. 2 | .. .. | Macroom Mary's Adair |
| Macroom Princess 4th .. | C.R. | 273 | N.C.K. | 5,477 | 5·85 | 320·6 | 230 | Jr. 2 | .. .. | Macroom Fairy's Adair |
| Macroom Robin's Ellen .. | C.R. | 273 | N.C.K. | 5,139 | 6·30 | 323·7 | 230 | Jr. 2 | .. .. | Clifford Farm Robin Adair |
| View Banks Bonnie Mary | 64744 | 246 | 4 | 6,162 | 5·46 | 336·5 | 350 | Mature | 322, 509, 587 | View Banks Bonnie Boy |
| **Devon Park Stud Farm (G. S. Daley), Lilydale, Jersey (15).** | | | | | | | | | | |
| Devon Park Aim's Empire | Vol. 31 | 273 | N.C.K. | 5,723 | 5·72 | 327·2 | 230 | Jr. 2 | .. .. | Karrara Eileen's Aim |
| Devon Park Day Dream .. | Vol. 31 | 273 | N.C.K. | 4,930 | 5·95 | 293·5 | 230 | Jr. 2 | .. .. | Karrara Sporting Standard |
| Devon Park Pioneer Empire | Vol. 31 | 273 | N.C.K. | 4,434 | 5·98 | 265·1 | 230 | Jr. 2 | .. .. | Karrara Sporting Standard |
| Devon Park Pioneer Isle .. | Vol. 31 | 273 | N.C.K. | 6,294 | 5·21 | 327·9 | 230 | Jr. 2 | .. .. | Karrara Sporting Standard |
| Devon Park Pioneer Lotus 2nd | Vol. 31 | 273 | N.C.K. | 5,298 | 5·66 | 299·7 | 230 | Jr. 2 | .. .. | Karrara Sporting Standard |
| Devon Park Pioneer Noella 4th | Vol. 31 | 273 | N.C.K. | 5,048 | 5·43 | 274·0 | 230 | Jr. 2 | .. .. | Karrara Sporting Standard |
| Devon Park Pioneer Primrose 2nd | Vol. 13 | 273 | 12½ | 4,764 | 5·54 | 263·9 | 230 | Jr. 2 | .. .. | Karrara Sporting Standard |
| Devon Park Pioneer Ricious | Vol. 31 | 273 | N.C.K. | 4,617 | 5·88 | 271·6 | 230 | Jr. 2 | .. .. | Karrara Sporting Standard |
| Devon Park Pioneer Tressie | Vol. 31 | 273 | N.C.K. | 5,627 | 5·74 | 323·0 | 230 | Jr. 2 | .. .. | Karrara Sporting Standard |
| Karrara Fancy Madeira 2nd | 72116 | 273 | N.C.K. | 5,536 | 5·16 | 285·5 | 350 | Mature | 395, 498, 419, 406 | Springhurst Perree's Quality |
| Karrara Oxford's Primrose | 77081 | 273 | N.C.K. | 6,777 | 5·80 | 393·2 | 350 | Mature | 361, 431, 407 | Karrara Golden Oxford |
| Karrara Standard Gem .. | 77087 | 273 | N.C.K. | 7,148 | 5·27 | 376·9 | 330 | Sr. 4 | 308, 362, 390 | Brampton Sporting Standard (Imp.) |
| Karrara Tecoma's Eve .. | 77092 | 210 | N.C.K. | 3,367 | 5·92 | 199·3 | 350 | Mature | 347, 385, 194 | Karrara Christmas Eve |
| Selsey Ranunculus 2nd .. | 69066 | 273 | N.C.K. | 6,755 | 5·28 | 356·8 | 350 | Mature | 349, 312 .. | Brampton Sporting Standard (Imp.) |
| Selsey Ricious 2nd .. | 73881 | 273 | N.C.K. | 7,268 | 6·13 | 445·3 | 350 | Mature | 321, 450, 538, 524, 441 | Samares Golden Prince (Imp.) |
| **Dookie Agricultural College, Dookie, Ayrshire (1).** | | | | | | | | | | |
| Dookie Shirley's Lass .. | 32244 | 273 | N.C.K. | 8,976 | 3·39 | 303·9 | 350 | Mature | 263, 360, 355, 244 | Tregorland Indispensible |
| **Doyle, Dr. G., Arthur's Creek, Jersey (1).** | | | | | | | | | | |
| Streamville Paillis .. | Vol. 31 | 273 | 8 | 4,839 | 5·18 | 250·5 | 250 | Sr. 2 | 118 .. | Maxmount Pearl's Master |
| **Dunmore, T. J., Melton, Jersey (5).** | | | | | | | | | | |
| Laura Dell Bright Bet .. | Vol. 31 | 273 | 13 | 5,557 | 6·29 | 344·4 | 270 | Jr. 3 | 233 .. | Muswell Reflection |
| Laura Dell Glowena .. | 77291 | 273 | 14 | 7,011 | 5·33 | 373·6 | 330 | Sr. 4 | 242, 334, 359 | Muswell Reflection |
| Laura Dell Glow Rose .. | 82373 | 273 | 14 | 7,476 | 5·85 | 437·4 | 310 | Jr. 4 | 402, 310 .. | Muswell Reflection |
| Laura Dell Lillibet .. | 72361 | 273 | 19 | 8,436 | 6·60 | 556·4 | 350 | Mature | 407, 462, 462, 515 | Clarendon Eyre L'Aiglon |
| Laura Dell Lisbet .. | Vol. 31 | 273 | 11½ | 4,430 | 5·59 | 247·7 | 230 | Jr. 2 | .. .. | Laura Dell Cariad's Aim |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emmett, Mrs. S., and Sons, Stanhope, Jersey (5).** | | | | | | | | | | |
| Shenstone Duchess 5th .. | C.R. | 273 | N.C.K. | 5,361 | 5·09 | 272·9 | 230 | Jr. 2 | .. .. | The Wattles Young Gamboge 4th |
| Shenstone Linda 7th .. | Vol. 32 | 273 | N.C.K. | 7,100 | 4·83 | 343·1 | 310 | Jr. 4 | .. .. | Pine Ridge Golden Duke |
| Shenstone Linda's Angel .. | C.R. | 273 | N.C.K. | 4,945 | 5·58 | 276·0 | 230 | Jr. 2 | .. .. | The Wattles Young Gamboge 4th |
| Shenstone Pearl 5th .. | Vol. 32 | 240 | N.C.K. | 5,370 | 5·81 | 312·2 | 350 | Mature | .. .. | Kings Vale Monica's 23rd Son |
| Shenstone Princess 2nd .. | 73895 | 240 | N.C.K. | 5,767 | 5·33 | 307·2 | 350 | Mature | .. .. | Kings Vale Monica's 23rd Son |
| **Enders, N. E., Stanhope, Jersey (1).** | | | | | | | | | | |
| The Wattles Silvermine 19th | 89274 | 240 | .. | 5,985 | 4·98 | 298·1 | 270 | Jr. 3 | 257 .. | Belgonia Design's Aim |
| **Everist, F. R., Tyabb, Red Poll (1).** | | | | | | | | | | |
| Naranghi Doris .. .. | 9043A | 240 (Herd withdrawn) | .. | 7,800 | 4·05 | 315·7 | 290 | Sr. 3 | 244 .. | Bundure Wiseboy |
| **Fairchild and Clutterbuck, Tinamba, Jersey (12).** | | | | | | | | | | |
| Vaucluse Butterfly 2nd .. | 89447 | 273 | N.C.K. | 5,667 | 6·20 | 351·6 | 290 | Sr. 3 | 279, 349 .. | Vaucluse Master 6th |
| Vaucluse Daphne 8th .. | Vol. 31 | 273 | N.C.K. | 5,936 | 6·46 | 383·3 | 270 | Jr. 3 | 314 .. | Vaucluse Masterpiece |
| Vaucluse Duchess 5th .. | 84384 | 273 | N.C.K. | 5,720 | 5·77 | 329·8 | 310 | Jr. 4 | 308 .. | Vaucluse Masterpiece |
| Vaucluse Empress 8th .. | 79406 | 273 | N.C.K. | 7,003 | 5·34 | 374·3 | 350 | Mature | 286, 376, 360 | Vaucluse Masterpiece |
| Vaucluse Flower 4th .. | Vol. 31 | 273 | N.C.K. | 6,956 | 5·72 | 398·1 | 270 | Jr. 3 | 288 .. | Vaucluse Master 6th |
| Vaucluse Free Girl 2nd .. | Vol. 31 | 273 | N.C.K. | 5,781 | 5·86 | 338·8 | 250 | Sr. 2 | 319 .. | Vaucluse Masterpiece |
| Vaucluse Madrigal 2nd .. | 84337 | 273 | N.C.K. | 7,539 | 4·71 | 355·2 | 350 | Mature | 462, 464, 381 | Paisley Master |
| Vaucluse Marie Rose 2nd .. | 84388 | 273 | N.C.K. | 6,081 | 5·22 | 317·4 | 350 | Mature | 322, 461, 411 | Vaucluse Masterpiece |
| Vaucluse Pansy 2nd .. | 84390 | 273 | N.C.K. | 6,159 | 5·75 | 353·9 | 350 | Mature | 347, 335 .. | Vaucluse Masterpiece |
| Vaucluse Silvermine .. | Vol. 31 | 273 | N.C.K. | 7,139 | 6·10 | 435·7 | 270 | Jr. 3 | 361 .. | Vaucluse Masterpiece |
| Vaucluse Tilly 2nd .. | Vol. 32 | 273 | N.C.K. | 6,139 | 4·48 | 274·8 | 350 | Mature | 318, 337, 373, 405 | Vaucluse Masterpiece |
| Vaucluse Viola 3rd .. | Vol. 31 | 273 | N.C.K. | 7,863 | 4·79 | 376·9 | 250 | Sr. 2 | 268 .. | Vaucluse Masterpiece |
| **Fixter, A., Boisdale, Guernsey (4).** | | | | | | | | | | |
| Avonview Cam .. .. | 9863 | 273 | 17½ | 7,029 | 4·68 | 329·0 | 230 | Jr. 2 | .. .. | Yarraview Renown |
| Avonview Dulcie .. | 2537 | 273 | 20 | 7,998 | 5·78 | 462·7 | 350 | Mature | 294, 317, 344, 348, 457, 428, 431, 481, 472, 378, 429 | Melbourne Sandboy 6th |
| Avonview Elaine .. | 6728 | 273 | 14 | 7,980 | 5·58 | 445·6 | 350 | Mature | 307, 398, 404, 379, 430 | Kentdale Monogram |
| Avonview Eva .. .. | Vol. 15 | 273 | 20 | 7,035 | 5·09 | 357·9 | 230 | Jr. 2 | .. .. | Yarraview Renown |
| **Forshaw, A. W., Seville, Ayrshire (5).** | | | | | | | | | | |
| Glen Athol Quandary .. | 31405 | 210 | N.C.K. | 6,757 | 3·72 | 251·3 | 350 | Mature | .. .. | Holly Green Design |
| Hollybank Gerty .. | C.R. | 273 | N.C.K. | 4,364 | 4·06 | 177·0 | 250 | Sr. 2 | .. .. | Alanvale Supply |
| Hollybank Linette 2nd .. | C.R. | 240 | N.C.K. | 4,537 | 3·80 | 172·5 | 250 | Sr. 2 | .. .. | Gowrie Park Bonnie Scout |
| Hollybank Topsy .. | 34650 | 150 | N.C.K. | 3,547 | 3·26 | 115·7 | 330 | Sr. 4 | .. .. | Gowrie Park Bonnie Scout |
| Willowmoor Morning Star | C.R. | 210 | N.C.K. | 2,535 | 4·21 | 106·6 | 230 | Jr. 2 | .. .. | Inverurie Christopher |
| **Gay, W. C. R., Yarram, Jersey (6).** | | | | | | | | | | |
| Elm Grove Duchess 2nd .. | Vol. 31 | 273 | N.C.K. | 7,323 | 4·91 | 359·9 | 230 | Jr. 2 | .. .. | Elm Grove Noble's Songster |
| Elm Grove Golden Silverbelle | 86132 | 273 | N.C.K. | 5,383 | 5·92 | 318·9 | 330 | Sr. 4 | 302, 318 .. | Elm Grove Gold Star |
| Elm Grove Island Maid 4th | Vol. 31 | 273 | N.C.K. | 6,142 | 5·54 | 340·4 | 230 | Jr. 2 | .. .. | Elm Grove Noble's Songster |
| Elm Grove Island Queen 5th | Vol. 31 | 273 | N.C.K. | 7,380 | 4·41 | 325·1 | 230 | Jr. 2 | .. .. | Elm Grove Noble's Songster |
| Elm Grove Laurette 2nd .. | 61465 | 273 | N.C.K. | 9,990 | 5·29 | 528·6 | 350 | Mature | 310, 501, 423, 544, 436 | Elm Grove Graceful Masterpiece |
| Elm Grove Orchid .. | 71182 | 273 | N.C.K. | 6,917 | 5·23 | 362·1 | 350 | Mature | 449, 484, 484 | Gold Star of Melrose |
| **Grice, C. S., Somerville, Jersey (9).** | | | | | | | | | | |
| Glenoma Heroine .. | 76448 | 273 | N.C.K. | 6,705 | 6·38 | 427·6 | 350 | Mature | 314, 342, 341 | Clarendon Eyre Eminent Barrister 9th |
| Glenoma Heroine 2nd .. | Vol. 31 | 273 | N.C.K. | 4,911 | 6·94 | 340·6 | 250 | Sr. 2 | .. .. | Banyule Camber |
| Glenoma Lady Blister .. | 86470 | 273 | N.C.K. | 8,157 | 5·35 | 436·5 | 290 | Sr. 3 | 336 .. | Banyule Camber |
| Glenoma Lady Silvermine | Vol. 31 | 273 | N.C.K. | 4,872 | 6·22 | 303·0 | 250 | Sr. 2 | .. .. | Glenoma Perree Aim |
| Glenoma Perree's Girl 2nd | 86471 | 273 | N.C.K. | 4,792 | 5·68 | 272·1 | 270 | Jr. 3 | 250 .. | Banyule Camber |
| Glenoma Princess Madeira | 81511 | 273 | N.C.K. | 8,097 | 6·40 | 518·6 | 310 | Jr. 4 | 325 .. | War Valour (Imp.) |
| Glenoma Princess Madeira 2nd | Vol. 31 | 250 | N.C.K. | 5,607 | 5·94 | 332·9 | 230 | Jr. 2 | .. .. | Banyule Camber |
| Glenoma Silvermine 3rd .. | Vol. 31 | 273 | N.C.K. | 4,799 | 6·20 | 297·7 | 230 | Jr. 2 | .. .. | Banyule Camber |
| Glenoma Suspense 3rd .. | Vol. 31 | 273 | N.C.K. | 5,489 | 5·55 | 304·4 | 230 | Jr. 2 | .. .. | Banyule Camber |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk last day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Handbury, J. E., and Son, Toora, Jersey (3).** | | | | | | | | | | |
| Tooravale March Galinthia | 89331 | 273 | N.C.K. | 4,708 | 6·18 | 290·9 | 290 | Sr. 3 | 277 .. | Pinewood's Aristocrat (Imp.) |
| Tooravale Princess 39th .. | 89332 | 273 | N.C.K. | 7,715 | 5·52 | 426·0 | 350 | Mature | 280 .. | Pinewood's Aristocrat (Imp.) |
| Tooravlae Princess 50th .. | Vol. 31 | 180 | N.C.K. | 2,970 | 5·21 | 154·8 | 250 | Sr. 2 | .. .. | Tooravale Axis |
| **Hardie, R., Lardner, Jersey (8).** | | | | | | | | | | |
| Dingley Dell Prudence .. | 71023 | 273 | N.C.K. | 10,452 | 4·25 | 443·7 | 350 | Mature | 454 .. | Clydevale Ventilation |
| Ellendale Utopia .. | 76094 | 273 | N.C.K. | 5,888 | 4·82 | 284·0 | 350 | Mature | 386, 385, 319 | Clarendon Eyre Oxford's Observer |
| Glen Urquhart Gadget's Princess | Vol. 32 | 273 | 10½ | 5,702 | 6·25 | 356·6 | 230 | Jr. 2 | .. .. | Windrest Gadget's Dreamer |
| Glen Urquhart Golden Duchess | 86373 | 273 | N.C.K. | 6,809 | 4·75 | 323·1 | 310 | Jr. 4 | 332, 211 .. | Bellefaire Golden Chevron |
| Glen Urquhart Mistress Nancy | Vol. 31 | 273 | 9½ | 6,494 | 5·03 | 385·0 | 270 | Jr. 3 | 356 .. | Maxmount Pearl's Master |
| Glen Urquhart Twinkle .. | Vol. 32 | 273 | N.C.K. | 6,533 | 5·81 | 379·4 | 230 | Jr. 2 | .. .. | Windrest Gadget's Dreamer |
| Green Glen Merit .. | 76612 | 273 | 4½ | 6,119 | 4·67 | 285·5 | 350 | Mature | .. .. | Dunmore Bright Star |
| Maxmount Elsie .. .. | Vol. 32 | 273 | 10 | 5,801 | 5·38 | 312·3 | 230 | Jr. 2 | .. .. | Maxmount Danny Boy |
| **Hartley, C. G., Dandenong, Jersey (9).** | | | | | | | | | | |
| Avon Jasmine .. .. | 74951 | 273 | N.C.K. | 6,551 | 5·46 | 357·4 | 350 | Mature | 437, 626, 710, 305 | Ruby's Beau (Imp.) |
| Barrowby Rose Midget .. | 65357 | 273 | N.C.K. | 5,363 | 5·19 | 278·4 | 350 | Mature | 340, 436, 383, 398, 322 | Mornmoot Meteor |
| Belgonia Eileen 8th .. | 70227 | 273 | N.C.K. | 6,014 | 4·66 | 280·3 | 350 | Mature | 362, 397, 410, 245 | Aim High (Imp.) |
| Bonnay Countess Charm .. | 85262 | 273 | N.C.K. | 5,984 | 5·01 | 299·5 | 310 | Jr. 4 | 261 .. | Bonnay Selbram's Emblem |
| Bonnay Edith .. .. | Vol. 32 | 273 | N.C.K. | 4,367 | 5·70 | 248·9 | 230 | Jr. 2 | .. .. | Selsey Brampton Boy |
| Hildason Midget 2nd .. | Vol. 32 | 273 | N.C.K. | 4,226 | 5·30 | 224·1 | 230 | Jr. 2 | .. .. | Mornmoot Marmont 2nd |
| Selsey Great Lotus .. | Vol. 31 | 273 | N.C.K. | 4,591 | 5·75 | 264·1 | 250 | Sr. 2 | 184 .. | Selsey Great Prometheus |
| Weir View Golden Design .. | 59968 | 273 | N.C.K. | 6,380 | 4·91 | 313·0 | 350 | Mature | 323, 477, 473, 370, 425, 454, 243 | Weir View Golden Duke |
| Windrest Gadget's Sunbeam | Vol. 31 | 273 | N.C.K. | 5,504 | 6·46 | 355·8 | 310 | Jr. 4 | 372 .. | Gadget (Imp.) |
| **Harvey, T., Boisdale, Jersey (7).** | | | | | | | | | | |
| Jerseyholm Bluebell 60th | 81952 | 273 | N.C.K. | 6,051 | 5·63 | 343·8 | 310 | Jr. 4 | 304 .. | Orphanage Molly's Commander |
| Jerseyholm Bluebell 74th | Vol. 32 | 273 | N.C.K. | 6,351 | 4·86 | 308·5 | 230 | Jr. 2 | .. .. | Mornmoot Memnon 2nd |
| Jerseyholm Bluebell 75th | Vol. 32 | 273 | N.C.K. | 6,181 | 5·75 | 355·4 | 230 | Jr. 2 | .. .. | Mornmoot Memnon 2nd |
| Jerseyholm Empress 64th | 71968 | 273 | N.C.K. | 9,977 | 5·44 | 542·7 | 350 | Mature | 373, 458, 463, 538 | Orphanage Molly's Commander |
| Jerseyholm Empress 65th | 71969 | 273 | N.C.K. | 8,843 | 4·77 | 421·5 | 350 | Mature | 233, 297, 364, 372 | Orphanage Molly's Commander |
| Jerseyholm Kirsty 45th .. | Vol. 32 | 273 | N.C.K. | 6,544 | 5·31 | 347·4 | 230 | Jr. 2 | .. .. | Orphanage Zaffarine Chief |
| Jerseyholm Lady Marge 23rd | 76963 | 273 | N.C.K. | 7,973 | 4·59 | 366·0 | 330 | Sr. 4 | 365, 338 .. | Mornmoot Memnon 2nd |
| **Haywood, Dr. A. R., Hastings, Jersey (7).** | | | | | | | | | | |
| Avon Princess Golden .. | 60370 | 273 | N.C.K. | 8,762 | 5·30 | 464·4 | 350 | Mature | 394, 412, 574 | Ruby's Beau (Imp.) |
| Windrest Chevy .. .. | 42529 | 273 | N.C.K. | 7,115 | 5·14 | 366·0 | 350 | Mature | 251, 359, 289, 337, 412, 397, 426, 560, 566, 319, 358 | Edmenton Rarius |
| Windrest Chevy's Babette | 89669 | 273 | N.C.K. | 7,208 | 5·99 | 431·4 | 270 | Jr. 3 | 312 .. | Gadget (Imp.) |
| Windrest Iris' Starbright | Vol. 31 | 273 | N.C.K. | 7,935 | 5·55 | 440·5 | 350 | Mature | 433, 388 .. | Gadget (Imp.) |
| Windrest Island Goldmine | 69733 | 273 | N.C.K. | 11,400 | 4·77 | 544·2 | 350 | Mature | 319, 430, 602, 659, 412 | Gadget (Imp.) |
| Windrest Rosebay's Chevy | Vol. 31 | 273 | N.C.K. | 6,803 | 4·81 | 327·5 | 270 | Jr. 3 | 268 .. | Glen Iris Rosebays's Noble |
| Windrest Rosebay's Chevy 2nd | Vol. 31 | 273 | N.C.K. | 4,706 | 5·67 | 266·7 | 230 | Jr. 2 | .. .. | Glen Iris Rosebay Noble |
| **Hicks, E. J., Blains, Jersey (1).** | | | | | | | | | | |
| Echuca Essie 2nd .. | 81111 | 240 (Herd withdrawn) | .. | 6,150 | 5·55 | 341·3 | 290 | Sr. 3 | 360 .. | Ullina Bellboy |
| **Higgins, J. A. A., Keysborough, Guernsey (2).** | | | | | | | | | | |
| Brighton Vale Mabel .. | Vol. 15 | 273 | 9 | 3,732 | 4·38 | 163·5 | 290 | Sr. 3 | .. .. | Melbourne Alain D'or |
| Brighton Vale Maureen .. | Vol. 15 | 273 | 10 | 3,602 | 4·55 | 164·0 | 230 | Jr. 2 | .. .. | Melbourne Alain D'or |
| **Hore, E., Leitchville, Jersey (1).** | | | | | | | | | | |
| Viewbank's Gay Girl .. | 59379 | 273 | N.C.K. | 5,745 | 5·36 | 308·1 | 350 | Mature | 368 .. | Viewbank's Bonny Boy |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Hore, M. T., Horfield, Friesian (9).** | | | | | | | | | | |
| Elmar Berry Segis .. | C.R. | 150 | N.C.K. | 3,510 | 3·16 | 110·9 | 270 | Jr. 3 | .. .. | Elmar Rosberry |
| Elmar Cello .. .. | C.R. | 273 | N.C.K. | 7,207 | 3·28 | 236·5 | 230 | Jr. 2 | .. .. | Lerderderg Violincello |
| Elmar Florida .. .. | C.R. | 273 | N.C.K. | 5,943 | 4·37 | 259·7 | 230 | Jr. 2 | .. .. | Elmar Majoe Rock |
| Elmar Lassie .. .. | Vol. 15 | 273 | N.C.K. | 12,251 | 2·86 | 350·0 | 350 | Mature | 298, 381, 570, 459, 557, 369 | Elmar Sylvia's Lad |
| Elmar Onia Beauty .. | Vol. 15 | 273 | N.C.K. | 8,439 | 3·46 | 291·7 | 270 | Jr. 3 | 305 .. | Burnbank Iona Rock |
| Elmar Rock Keyes 2nd .. | C.R. | 273 | N.C.K. | 6,755 | 2·97 | 200·7 | 250 | Sr. 2 | .. .. | Burnbank Iona Rock |
| Elmar Sonia .. .. | C.R. | 273 | N.C.K. | 7,261 | 3·79 | 275·4 | 270 | Jr. 3 | 257 .. | Elmar Majoe Galatea |
| Elmar Trinette .. .. | Vol. 15 | 273 | N.C.K. | 8,205 | 3·18 | 261·2 | 250 | Sr. 2 | 227 .. | Elmar Majoe Galatea |
| Kelvale Maytime .. | Vol. 15 | 273 | N.C.K. | 12,267 | 3·57 | 438·2 | 330 | Sr. 4 | 334, 384 .. | Kelvale Aristrocrat |
| **Huffer, Estate of the late J. A., Gormandale, Jersey (6).** | | | | | | | | | | |
| Glenvalley Coral Sand 6th | 71543 | 273 | N.C.K. | 4,968 | 5·52 | 274·2 | 350 | Mature | 289, 301, 298, 332, 379 | Glenvalley Mercedes Chief |
| Glenvalley Gladys .. | 86561 | 273 | N.C.K. | 7,593 | 4·65 | 353·1 | 350 | Mature | 285, 369, 400, 466 | Yuleba Fancy Twylish 3rd |
| Glenvalley Handsome Girl 6th | 71544 | 273 | N.C.K. | 5,070 | 5·51 | 279·4 | 350 | Mature | 284, 330, 366, 343, 374 | Glenvalley Mercedes Chief |
| Glenvalley Handsome Girl 11th | Vol. 31 | 273 | N.C.K. | 5,679 | 6·42 | 364·4 | 270 | Jr. 3 | 334 .. | Glenvalley President |
| Glenvalley Mercedes Fancy | 71545 | 273 | N.C.K. | 5,181 | 6·02 | 311·8 | 350 | Mature | 241, 338, 356 | Yuleba Fancy Twylish 3rd |
| Glenvalley Waverley Lass 9th | 76539 | 273 | N.C.K. | 7,191 | 5·79 | 416·3 | 350 | Mature | 332, 418, 420, 478 | Yuleba Fancy Twylish 3rd |
| **Hurrey, Estate of the late W. H. Koonwarra, Jersey (9).** | | | | | | | | | | |
| Kooreena Audrey 15th .. | 87282 | 273 | N.C.K. | 6,206 | 6·84 | 424·5 | 350 | Mature | 337, 397, 465, 414 | Kooreena Good Luck |
| Kooreena Audrey 18th .. | Vol. 31 | 273 | N.C.K. | 3,362 | 5·55 | 186·5 | 230 | Jr. 2 | .. .. | Kooreena Rover 3rd |
| Kooreena Carrie 7th .. | 58055 | 273 | N.C.K. | 4,822 | 7·08 | 341·4 | 350 | Mature | 279, 239, 378, 420, 376, 366, 329 | Kooreena Carrie 3rd's Halo |
| Kooreena Choice's Gift .. | Vol. 31 | 273 | N.C.K. | 4,876 | 5·94 | 290·0 | 230 | Jr. 2 | .. .. | Kooreena Lively |
| Kooreena Delight .. | Vol. 31 | 273 | N.C.K. | 3,627 | 6·54 | 237·3 | 230 | Jr. 2 | .. .. | Kooreena Lively |
| Kooreena Minerva 4th Venus | Vol. 31 | 273 | N.C.K. | 5,621 | 5·01 | 281·6 | 350 | Mature | 304, 413, 388, 358 | Kooreena Handsome Lad |
| Kooreena Trinket .. | Vol. 31 | 240 (Sold) | .. | 3,765 | 5·65 | 212·6 | 350 | Mature | 338, 384, 318 | Kooreena Carrie 4th's Laddie |
| Kooreena Trinket 2nd .. | Vol. 31 | 273 | N.C.K. | 4,039 | 6·21 | 250·8 | 270 | Jr. 3 | 208 .. | Kooreena Rover 2nd |
| Kooreena Yo Yo 8th .. | 87295 | 240 (Sold) | .. | 4,335 | 6·81 | 295·4 | 350 | Mature | 326, 329, 318 | Kooreena Carrie 4th's Laddie |
| **Jackson, H., Lockington, Jersey (3).** | | | | | | | | | | |
| Lockington Starette's Gem | Vol. 31 | 273 | N.C.K. | 9,831 | 4·96 | 487·4 | 310 | Jr. 4 | 510 .. | Belgonia Mala |
| Pine Ridge Rose Dream 5th | Vol. 31 | 273 | N.C.K. | 9,228 | 4·95 | 456·8 | 310 | Jr. 4 | 310, 453 .. | Belgonia Magnetic Chief |
| Pine Ridge Starette 4th .. | 68655 | 273 | N.C.K. | 11,051 | 4·94 | 545·4 | 350 | Mature | 413, 583 .. | Duke of the Lake (Imp.) |
| **Johnson, F. G., Horsham, Jersey (1).** | | | | | | | | | | |
| Firebrace Frances .. | Vol. 31 | 273 | N.C.K. | 3,180 | 5·41 | 172·1 | 230 | Jr. 2 | .. .. | Orphanage Arthur |
| **Keele, H. A., Bamawm, Jersey (13).** | | | | | | | | | | |
| Waroin Buttergirl .. | 89526 | 273 | N.C.K. | 6,170 | 5·09 | 314·0 | 230 | Jr. 2 | .. .. | Pine Ridge Volunteer |
| Waroin Dragonfly .. | 69608 | 273 | N.C.K. | 7,622 | 5·15 | 392·9 | 350 | Mature | 450, 392, 444 | The Wattles Gold Boy |
| Waroin Dragonfly 2nd .. | 84462 | 273 | N.C.K. | 5,632 | 5·30 | 298·4 | 270 | Jr. 3 | .. .. | Pine Ridge Volunteer |
| Waroin Eileen .. .. | 89527 | 273 | N.C.K. | 5,175 | 5·67 | 293·6 | 230 | Jr. 2 | .. .. | Pine Ridge Volunteer |
| Waroin Fly .. .. | 69609 | 273 | N.C.K. | 6,557 | 6·15 | 403·3 | 350 | Mature | 436, 475, 463 | The Wattles Gold Boy |
| Waroin Fly 2nd .. .. | 84465 | 273 | N.C.K. | 7,304 | 5·89 | 430·2 | 270 | Jr. 3 | .. .. | Pine Ridge Volunteer |
| Waroin Gnome 2nd .. | 88467 | 273 | N.C.K. | 6,252 | 5·01 | 313·5 | 270 | Jr. 3 | 259 .. | Waroin Trooper Boy |
| Waroin Gnome 3rd .. | 89529 | 210 | N.C.K. | 4,927 | 4·39 | 216·5 | 230 | Jr. 2 | .. .. | Pine Ridge Volunteer |
| Waroin Golden Wings .. | 79513 | 247 | N.C.K. | 7,597 | 4·82 | 365·9 | 330 | Sr. 4 | 294, 322 .. | The Wattles Gold Boy |
| Waroin Lisbeth 3rd .. | 89531 | 210 | N.C.K. | 3,765 | 5·54 | 208·4 | 230 | Jr. 2 | .. .. | Pine Ridge Volunteer |
| Waroin Locust .. .. | 74432 | 273 | N.C.K. | 6,839 | 5·36 | 366·9 | 350 | Mature | 313, 361, 406 | The Wattles Gold Boy |
| Waroin Marchfly .. | 55789 | 273 | N.C.K. | 6,717 | 5·08 | 341·4 | 350 | Mature | 435, 448, 389 | Maiwand Noble Duke |
| Waroin Wings 2nd .. | 89534 | 210 | N.C.K. | 4,245 | 5·53 | 234·9 | 230 | Jr. 2 | .. .. | Pine Ridge Volunteer |
| **Lancaster, E. H., Lilydale, Jersey (2).** | | | | | | | | | | |
| Beverley Bank Princess Heather | Vol. 31 | 273 | N.C.K. | 5,112 | 5·71 | 292·0 | 250 | Sr. 2 | 227 .. | Clifford Farm Repute |
| Clifford Farm Lois .. | Vol. 33 | 250 (Herd withdrawn) | N.C.K. | 6,450 | 4·96 | 320·1 | 250 | Sr. 2 | .. .. | Clifford Farm Sargeant Major |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Langlands, F. B., Hersham, Jersey (5).** | | | | | | | | | | |
| Brierwood Cornflower 3rd | Vol. 31 | 180 | N.C.K. | 2,842 | 5·18 | 147·2 | 270 | Jr. 3 | 258 | Werribee Leader |
| Brierwood Golden Millie 2nd | Vol. 31 | 273 | N.C.K. | 6,682 | 5·24 | 350·1 | 310 | Jr. 4 | 346 | Orphanage Charger |
| Brierwood Twylish Fern 2nd | C.R. | 180 | N.C.K. | 2,820 | 5·15 | 145·2 | 230 | Jr. 2 | .. | Werribee Leader |
| Brierwood Vanity 3rd .. | 85339 | 273 | N.C.K. | 5,105 | 5·28 | 269·3 | 310 | Jr. 4 | 310, 350 | Orphanage Charger |
| Brierwood Volunteer's Nancy | Vol. 33 | 180 | N.C.K. | 3,090 | 4·67 | 144·4 | 230 | Jr. 2 | .. | Werribee Leader |
| **Launder, A. P., Glen Waverley, Jersey (5).** | | | | | | | | | | |
| Boneo Modesty 2nd .. | Vol. 32 | 273 | N.C.K. | 3,214 | 5·14 | 165·1 | 230 | Jr. 2 | .. | Banyule Mollison |
| Devon Glen Gayflower* .. | Vol. 31 | 273 | N.C.K. | 3,162 | 6·39 | 202·1 | 270 | Jr. 3 | .. | Devon Glen Butter King |
| Nenagh Lady Lene 10th .. | Vol. 31 | 273 | N.C.K. | 4,479 | 5·50 | 246·5 | 270 | Jr. 3 | .. | Kyora Adore's Volunteer |
| Nenagh Starbright Pet .. | 88182 | 273 | N.C.K. | 6,951 | 5·16 | 358·8 | 290 | Sr. 3 | .. | Nenagh Starbright Volunteer |
| Nenagh Trinket 21st .. | Vol. 31 | 273 | N.C.K. | 4,550 | 5·87 | 267·1 | 270 | Jr. 3 | .. | Nenagh Major Starbright |
| * Calved 80 days before first test taken. | | | | | | | | | | |
| **Lind, A. E. and Sons, Mount Taylor, Jersey (9).** | | | | | | | | | | |
| Glenhope Tiddlewinks 11th | Vol. 31 | 273 | 21½ | 7,392 | 6·77 | 500·8 | 290 | Sr. 3 | 341 | Glenhope Baron 2nd |
| Sunny Dell Air Hostess .. | 89071 | 273 | 16 | 6,873 | 5·23 | 359·2 | 310 | Jr. 4 | 357, 345 | Banyule Mollison |
| Sunny Dell Andante .. | Vol. 32 | 273 | 11 | 5,228 | 6·35 | 332·2 | 230 | Jr. 2 | .. | Mornmoot War Chief |
| Sunny Dell Foxglove .. | C.R. | 273 | 9½ | 6,102 | 5·52 | 336·8 | 230 | Jr. 2 | .. | Latrobe Mascot |
| Sunny Dell Golden Standard | Vol. 32 | 273 | 13½ | 7,005 | 5·20 | 364·3 | 250 | Sr. 2 | .. | Brampton Noble Standard (Imp.) |
| Sunny Dell Lady Starbright | Vol. 32 | 273 | 17½ | 6,672 | 6·07 | 405·2 | 230 | Jr. 2 | .. | Mornmoot War Chief |
| Sunny Dell Lily .. .. | Vol. 32 | 273 | 23 | 7,879 | 4·39 | 345·5 | 230 | Jr. 2 | .. | Mornmoot War Chief |
| Sunny Dell Statuette 3rd.. | Vol. 32 | 273 | 18 | 6,256 | 5·71 | 357·4 | 230 | Jr. 2 | .. | Latrobe Mascot |
| Sunny Dell Delight .. | Vol. 32 | 273 | 12 | 6,743 | 4·94 | 333·1 | 230 | Jr. 2 | .. | Werribee Viceroy |
| **Linke, H. P., Tarrington, Dairy Shorthorn (2).** | | | | | | | | | | |
| Corresdean Lila 2nd .. | 1791E | 273 | 13½ | 7,982 | 3·87 | 308·7 | 350 | Mature | 255, 355, 304 | Drumneil Prince 3rd |
| Drumneil Daisy 4th .. | 1836E | 210 | 4 | 6,345 | 3·65 | 231·5 | 350 | Mature | 288, 352, 203, 279, 300 | Willow Park Lustre 3rd |
| **Longerenong Agricultural College, Dooen, Ayrshire (1).** | | | | | | | | | | |
| Longerenong Laureate 7th | 35676 | 273 | N.C.K. | 6,318 | 5·04 | 318·6 | 270 | Jr. 3 | .. | Dookie Signet |
| **Macauley, C. W., Rochester, Jersey (2).** | | | | | | | | | | |
| Taranah Chime 5th .. | 89147 | 273 | N.C.K. | 5,860 | 5·43 | 318·0 | 330 | Sr. 4 | 297, 408, 410 | Werribee Twylish Master |
| Taranah Rarity 5th .. | Vol. 31 | 273 | N.C.K. | 5,169 | 5·90 | 304·8 | 250 | Sr. 2 | 314 | Cormal Oxford Lad |
| **Maclean, F. P., Berwick, Jersey (3).** | | | | | | | | | | |
| Maxmount Gay Girl* .. | 87697 | 210 (Sold) | .. | 6,315 | 5·49 | 346·5 | 310 | Jr. 4 | .. | Maxmount Pearl's Master |
| Navuloa Grand Wyandotte† | 88153 | 210 | .. | 7,260 | 5·01 | 363·9 | 270 | Jr. 3 | .. | Navuloa Magnet's Grandmaster |
| Navuloa Laburnum's Princess* | 78043 | 210 | .. | 7,530 | 5·82 | 438·2 | 330 | Sr. 4 | 290, 329 | Staghorn Laburnum Masterpiece |
| * Calved 90 days before first test taken. † Calved 76 days before first test taken. | | | | | | | | | | |
| **McKenzie, Mrs. E. J. and Sons, Woodford, Jersey (3).** | | | | | | | | | | |
| Spring Valley Euphorbia 2nd | 78921 | 273 | 11 | 5,813 | 5·45 | 316·7 | 350 | Mature | 302, 319, 358 | Selsey Great Peer |
| Spring Valley Ranunculus 2nd | Vol. 31 | 273 | 17 | 7,824 | 4·22 | 330·5 | 270 | Jr. 3 | 303 | Spring Valley Euphorbia's Favourite |
| Spring Valley Virginia 53rd | Vol. 32 | 273 | 14½ | 5,733 | 5·38 | 308·2 | 230 | Jr. 2 | .. | Spring Valley Hope's Wizard |
| **McNabb, G. A., and Son, Irrewillipe East, Jersey (3).** | | | | | | | | | | |
| Greenwood Poetry .. | 71673 | 240 | N.C.K. | 5,370 | 6·10 | 327·4 | 350 | Mature | 290, 365, 394, 319 | Selsey Maranta's King |
| Maxon D's Alsyke 4th .. | Vol. 33 | 273 | N.C.K. | 4,560 | 5·88 | 268·3 | 230 | Jr. 2 | .. | Maxon Count's Dawn |
| Maxon S.B's. Pride .. | 82729 | 273 | N.C.K. | 6,414 | 5·72 | 366·7 | 310 | Jr. 4 | 304, 339 | Maxon Light's Starbright |
| **Maher, R. H., Tongala, Jersey (18).** | | | | | | | | | | |
| Rosemont Daisy 7th .. | 73758 | 273 | N.C.K. | 6,858 | 5·15 | 353·5 | 350 | Mature | 325, 352, 396, 441 | Rosemont Laddie Fowler 3rd |
| Rosemont Daisy 9th .. | 88807 | 273 | N.C.K. | 6,129 | 5·57 | 341·1 | 310 | Jr. 4 | 307, 343 | Belgonia Aim High |
| Rosemont Duchess Fowler 4th | 83718 | 273 | N.C.K. | 8,981 | 5·53 | 497·0 | 350 | Mature | 283, 383, 409 | Belgonia Perree |
| Rosemont Lady Fowler 15th | 64058 | 273 | 17 | 6,951 | 4·62 | 321·0 | 350 | Mature | 224, 398, 358 | Rosemont Golden Emblem |
| Rosemont Lady Fowler 51st | Vol. 31 | 273 | N.C.K. | 5,916 | 5·59 | 330·6 | 270 | Jr. 3 | 245 | Rosemont Perree's Maginot |
| Rosemont Lady Fowler 52nd | Vol. 31 | 273 | 16 | 6,558 | 4·84 | 317·1 | 250 | Sr. 2 | 282 | Rosemont Perree's Maginot |
| Rosemont Lassie Fowler 12th | 64061 | 273 | N.C.K. | 7,022 | 5·22 | 367·0 | 350 | Mature | 291, 301, 335, 289 | Rosemont Laddie Fowler 3rd |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk last day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Maher, R. H., Tongala, Jersey—*continued.*** | | | | | | | | | | |
| Rosemont Lassie Fowler 28th | Vol. 31 | 273 | 18½ | 6,266 | 5·84 | 366·1 | 270 | Jr. 3 | 321 .. | Belgonia Perree |
| Rosemont Laura 7th .. | 50461 | 273 | 10 | 6,105 | 5·38 | 328·7 | 350 | Mature | 247, 311, 315, 284, 335, 349 | Rosemont Laddie Fowler 3rd |
| Rosemont Laura 13th .. | 83732 | 273 | N.C.K. | 9,876 | 5·92 | 584·4 | 350 | Mature | 179, 354 .. | Belgonia Perree |
| Rosemont Laura 16th .. | Vol. 31 | 273 | N.C.K. | 6,702 | 5·05 | 338·6 | 270 | Jr. 3 | 287 .. | Belgonia Aim High |
| Rosemont Primrose 7th .. | 73764 | 273 | 13½ | 7,631 | 5·30 | 404·1 | 350 | Mature | 341, 465, 450 | Rosemont Laddie Fowler 3rd |
| Rosemont Primrose 11th .. | 83734 | 273 | N.C.K. | 8,085 | 5·41 | 437·1 | 350 | Mature | 193, 426 .. | Belgonia Aim High |
| Rosemont Silvermine 21st | 83741 | 273 | 12½ | 6,008 | 5·11 | 307·3 | 330 | Sr. 4 | 252, 342 .. | Belgonia Aim High |
| Rosemont Silvermine 22nd | 88818 | 273 | N.C.K. | 5,769 | 5·73 | 330·3 | 310 | Jr. 4 | 357 .. | Belgonia Aim High |
| **Maloney, P. J., Tongala, Jersey (5).** | | | | | | | | | | |
| Belgonia Gems Noella 11th | Vol. 31 | 273 | N.C.K. | 6,302 | 5·20 | 327·4 | 230 | Jr. 2 | .. .. | Belgonia Observer |
| Belgonia Junette 18th .. | Vol. 31 | 273 | N.C.K. | 5,486 | 5·56 | 305·2 | 230 | Jr. 2 | .. .. | Belgonia Observer |
| Belgonia Maria 18th .. | 85121 | 273 | N.C.K. | 7,907 | 5·41 | 427·9 | 270 | Jr. 3 | 335 .. | Baron Design (Imp.) |
| Belgonia Peggy 29th .. | 80223 | 273 | N.C.K. | 9,572 | 5·70 | 545·8 | 310 | Jr. 4 | 411, 453 .. | Baron Design (Imp.) |
| Belgonia Suspense 12th .. | 80230 | 273 | N.C.K. | 9,443 | 5·60 | 528·5 | 310 | Jr. 4 | 430, 552 .. | Baron Design (Imp.) |
| **Manly, R. A. A., Somerville, Dairy Shorthorn (1).** | | | | | | | | | | |
| Reedy Dainty 3rd .. | C.C. | 240 | .. | 3,195 | 3·71 | 118·6 | 230 | Jr. 2 | .. .. | Willow Park Imperial Cran 74th |
| **Meaklim Bros., Mooroopna, Dairy Shorthorn (6).** | | | | | | | | | | |
| Drumneil Fairy 6th .. | 1842E | 273 | N.C.K. | 10,044 | 3·87 | 388·8 | 350 | Mature | 299, 298, 339, 336 | Willow Park Lustre 3rd |
| Drumneil Nellie 6th .. | 1849E | 273 | 29 | 11,936 | 3·34 | 398·9 | 350 | Mature | 320, 300, 437, 460 | Willow Park Lustre 3rd |
| Drumneil Pearl 3rd .. | 1850E | 273 | 11 | 10,524 | 3·50 | 368·0 | 350 | Mature | 315, 329, 365 | Willow Park Lustre 3rd |
| Drumneil Princess 6th .. | 1853E | 273 | N.C.K. | 9,460 | 3·86 | 365·5 | 350 | Mature | 325, 227, 341, 396, 326 | Willow Park Lustre 3rd |
| Drumneil Princess 10th .. | 2462E | 273 | N.C.K. | 8,229 | 3·92 | 322·2 | 270 | Jr. 3 | 316 .. | Drumneil Comet |
| Drumneil Rosebud .. | 2464E | 273 | 26½ | 11,870 | 2·80 | 332·9 | 310 | Jr. 4 | 280, 370 .. | Willow Park Barrington 16th |
| **Moore, J., and Co., Yarram, Jersey (2).** | | | | | | | | | | |
| Tooloonook Peach 25th .. | Vol. 32 | 273 | N.C.K. | 3,231 | 4·79 | 154·7 | 230 | Jr. 2 | .. .. | Mornmoot Mormon 3rd |
| Tooloonook Rose 6th .. | Vol. 31 | 273 | N.C.K. | 4,062 | 5·40 | 219·5 | 290 | Sr. 3 | 237 .. | Belgonia Junette 2nd's Design |
| **Murdoch, J., and Son, Lismore, Jersey (1).** | | | | | | | | | | |
| Ismalia Countess 13th .. | Vol. 33 | 273 | N.C.K. | 4,983 | 5·23 | 260·8 | 230 | Jr. 2 | .. .. | Orphanage Jerry |
| **Nancarrow Bros., Kerang, Jersey (1).** | | | | | | | | | | |
| Pine Ridge Duchess 3rd .. | 68647 | 273 | N.C.K. | 10,212 | 5·19 | 530·2 | 350 | Mature | 398, 417, 470 | Duke of the Lake (Imp.) |
| **Nicholas, M. A., Sherbrooke, Jersey (2).** | | | | | | | | | | |
| Selsey Jersey Lily 2nd .. | 69063 | 273 | 19 | 8,907 | 5·56 | 495·3 | 350 | Mature | 428, 399, 422, 489, 471 | Samares Golden Prince (Imp.) |
| Selsey Roseleaf 5th .. | Vol. 31 | 273 | 8 | 3,879 | 6·36 | 246·9 | 230 | Jr. 2 | .. .. | Selsey Samares Master |
| **Nicholson, N. E., Lang Lang, Illawarra Shorthorn (5).** | | | | | | | | | | |
| Devondale Buttercup 12th | 35854 | 180 | N.C.K. | 3,445 | 4·72 | 162·6 | 350 | Mature | 274, 306 .. | Devondale Guardsman |
| Devondale Buttercup 17th | Vol. 9 | 150 | N.C.K. | 2,475 | 4·61 | 114·0 | 230 | Jr. 2 | .. .. | Devondale Guardsman |
| Devondale Plum 3rd .. | 35856 | 273 | N.C.K. | 5,287 | 4·01 | 211·8 | 350 | Mature | 265, 250 .. | Devondale Guardsman |
| Veresdale Heath .. .. | 33740 | 210 | N.C.K. | 5,115 | 3·86 | 197·6 | 350 | Mature | 250, 212, 220 | Ovensdale Pearl's Renown |
| Veresdale Posey .. .. | Vol. 9 | 150 | N.C.K. | 3,210 | 3·34 | 107·3 | 350 | Mature | 257, 284, 222 | Numbawarra Maiden's Sultan |
| **Noonan, G., Benalla, Jersey (1).** | | | | | | | | | | |
| Ambyne Noble Queen .. | 79967 | 273 | N.C.K. | 3,838 | 5·65 | 216·8 | 350 | Mature | 351, 356 .. | Avalon Noble 16th |
| **O'Neill, J., Echuca Village, Jersey (5).** | | | | | | | | | | |
| Ullina Bonnie .. .. | 69475 | 273 | 15 | 8,295 | 5·67 | 470·1 | 350 | Mature | 334, 303, 458, 503, 485 | Ballara Fancy King |
| Ullina Dorothy .. .. | 84339 | 273 | 13½ | 6,944 | 6·39 | 443·7 | 330 | Sr. 4 | 326, 413, 466 | Mornmoot Satisfaction's Warrior |
| Ullina Princess Mary .. | 89417 | 273 | 14 | 7,800 | 6·04 | 471·0 | 310 | Jr. 4 | 370, 453 .. | Mornmoot Satisfaction's Warrior |
| Ullina Princess Rose .. | 74312 | 273 | 12½ | 7,727 | 5·26 | 407·2 | 350 | Mature | 355, 421, 429, 399, 466 | Melrose Outlook |
| Ullina Yvonne .. .. | 74313 | 273 | 11 | 7,337 | 4·97 | 364·7 | 350 | Mature | 332, 382, 334, 357, 360 | Ballara Fancy King |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Parker, L. M., Tallarook, Dairy Shorthorn (8).** | | | | | | | | | | |
| Deep Dale Dainty 2nd .. | 2430E | 273 | N.C.K. | 6,436 | 3·73 | 239·9 | 270 | Jr. 3 | 221 .. | Willow Park Imperial Cran 34th |
| Deep Dale Daphne .. | 1806E | 273 | N.C.K. | 9,030 | 3·88 | 350·2 | 350 | Mature | 439, 374, 348, 432 | Willow Park Banker 3rd |
| Deep Dale Fairy .. | 1810E | 240 | N.C.K. | 7,950 | 4·16 | 331·1 | 350 | Mature | 297, 366, 452, 386 | Willow Park Banker 3rd |
| Deep Dale Fairy 2nd .. | 2435E | 273 | N.C.K. | 6,923 | 3·75 | 259·4 | 270 | Jr. 3 | 234 .. | Willow Park Imperial Cran 34th |
| Deep Dale Peach 2nd .. | 2437E | 273 | N.C.K. | 6,922 | 3·95 | 273·4 | 330 | Sr. 4 | 207, 288 .. | Willow Park Barrington 26th |
| Deep Dale Pearl 2nd .. | 2438E | 273 | N.C.K. | 8,383 | 4·08 | 341·8 | 330 | Sr. 4 | 219, 270 .. | Willow Park Barrington 26th |
| Deep Dale Polly 2nd .. | 2439E | 273 | N.C.K. | 7,058 | 4·03 | 284·7 | 350 | Mature | 295, 355, 277 | Willow Park Barrington 26th |
| Deep Dale Tulip 2nd .. | 2445E | 273 | N.C.K. | 5,979 | 3·98 | 237·8 | 270 | Jr. 3 | 179 .. | Willow Park Imperial Cran 34th |
| **Parkes, E. F., Trafalgar, Jersey (2).** | | | | | | | | | | |
| Irona Diana's Design .. | C.R. | 246 | N.C.K. | 3,327 | 5·24 | 174·3 | 230 | Jr. 2 | .. .. | Navua Sociable Designer |
| Irona Dreaming Cowslip .. | 71881 | 273 | N.C.K. | 10,209 | 5·81 | 593·5 | 350 | Mature | 263, 224, 226, 192, 229 | Dreamer's Hamptonne Star (Imp.) |
| **Pattison, G., Tongala, Ayrshire (2).** | | | | | | | | | | |
| Willow Park Lady VI .. | Vol. 37 | 273 | 16½ | 8,831 | 3·81 | 336·3 | 310 | Jr. 4 | 273 .. | Fulham Viscount |
| Willow Park Millicent .. | C.R. | 273 | 19 | 6,372 | 4·38 | 279·4 | 230 | Jr. 2 | .. .. | Fulham Viscount |
| **Payne, A. E. T., Lilydale, Guernsey (5).** | | | | | | | | | | |
| Yarraview Calm .. | 11954 | 273 | 18 | 6,931 | 5·52 | 382·6 | 310 | Jr. 4 | 373, 388 .. | Honoria's Benefactor (Imp.) |
| Yarraview Chamois .. | 9762 | 273 | 28½ | 10,706 | 6·27 | 671·8 | 350 | Mature | 420, 557, 593 | Yarraview Factor |
| Yarraview De Luxe .. | 8203 | 273 | 26 | 10,449 | 5·70 | 596·0 | 350 | Mature | 423, 488, 452, 564 | Honoria's Benefactor (Imp.) |
| Yarraview Embrace .. | 11961 | 273 | 19 | 6,734 | 4·64 | 312·5 | 230 | Jr. 2 | .. .. | Sunrose of Maple Lodge (Imp.) |
| Yarraview Ladylove .. | 11969 | 273 | 19 | 6,567 | 4·89 | 320·8 | 230 | Jr. 2 | .. .. | Sunrose of Maple Lodge (Imp.) |
| **Phillips, J. H., Swan Hill, Jersey (1).** | | | | | | | | | | |
| Ryeland's Romona .. | Vol. 32 | 273 | 20 | 8,025 | 5·47 | 438·9 | 230 | Jr. 2 | .. .. | Pine Ridge Stylish |
| **Powell, T. S., Mansfield, Jersey (6).** | | | | | | | | | | |
| Carellen Fancy Madeira 2nd | Vol. 31 | 273 | 10 | 3,630 | 4·80 | 174·4 | 230 | Jr. 2 | .. .. | Shepstone Royal Ensign |
| Carellen Golden Cream 5th | Vol. 31 | 273 | 9 | 3,407 | 5·68 | 193·4 | 230 | Jr. 2 | .. .. | Carellen Noble Duke |
| Carellen Golden Duchess 2nd | Vol. 31 | 273 | 16 | 5,583 | 5·05 | 281·9 | 230 | Jr. 2 | .. .. | Mornmoot Viceroy 2nd |
| Carellen Lady Margaret .. | 65876 | 273 | 18 | 7,543 | 5·15 | 388·1 | 350 | Mature | 440, 499, 518, 517 | Darnum Park Lord Starbright |
| Carellen Northwood Clementine | 85575 | 273 | 12 | 5,593 | 4·88 | 272·8 | 270 | Jr. 3 | .. .. | Werribee Planet |
| Carellen Stellar Pearl .. | Vol. 33 | 240 | 4 | 3,372 | 4·77 | 161·0 | 230 | Jr. 2 | .. .. | Mornmoot Viceroy 2nd |
| **Prince, Mrs. H. A., Swan Hill, Jersey (4).** | | | | | | | | | | |
| Kantara Jessamine 2nd .. | 40487 | 273 | N.C.K. | 10,008 | 5·02 | 502·9 | 350 | Mature | 331, 363, 404, 422, 515, 442, 400, 459, 413, 451, 439, 408 | Glen Iris Valiant Count |
| Pine Ridge Dream Girl 2nd | 68644 | 210 (Sold) | .. | 7,500 | 5·52 | 413·8 | 350 | Mature | 386, 499, 571, 472 | Duke of the Lake (Imp.) |
| Pine Ridge Molly 4th .. | 73498 | 210 | .. | 6,480 | 6·27 | 406·6 | 350 | Mature | 464, 578, 473 | Pine Ridge Golden Duke |
| Ryeland's Brooklet .. | 83819 | 273 (Sold) | N.C.K. | 8,361 | 4·90 | 410·0 | 350 | Mature | 290, 345, 388, 407 | Banaview Master |
| **Raggatt, F., Tongala, Jersey (1).** | | | | | | | | | | |
| Strathbow Goldie 43rd .. | Vol. 31 | 273 | N.C.K. | 5,798 | 5·21 | 301·8 | 230 | Jr. 2 | .. .. | Lynroy National |
| **Read, Estate of the late J. D., Springhurst, Jersey (2).** | | | | | | | | | | |
| Springhurst Tomato Napoleonette | 78936 | 240 | 4 | 4,927 | 6·51 | 320·6 | 330 | Sr. 4 | 421, 387 .. | Springhurst Tomato's Pride |
| Springhurst Narcissus Soeurette | 69130 | 273 | 11 | 6,940 | 5·67 | 393·6 | 350 | Mature | 500, 488, 488, 433 | Bellefaire Superlative Pride |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Reid, Miss B. B., Bundoora, Jersey (3).** | | | | | | | | | | |
| Jubilee Jasmine .. .. | Vol. 32 | 273 | 9 | 3,657 | 5·42 | 198·2 | 230 | Jr. 2 | .. .. | Jubilee Richlight |
| Jubilee Liana .. .. | Vol. 32 | 273 | 12 | 4,498 | 4·55 | 204·6 | 230 | Jr. 2 | .. .. | Werribee Stylish Masterpiece |
| Jubilee Tuberose .. | 72017 | 273 | 7 | 3,823 | 5·73 | 219·2 | 350 | Mature | 182, 252 .. | Jubilee Richlight |
| **Ronalds, O., and Son, Tarago, Jersey (3).** | | | | | | | | | | |
| Jindivick Clementine 2nd .. | Vol. 31 | 273 | N.C.K. | 8,976 | 4·98 | 447·1 | 250 | Sr. 2 | 378 .. | Mornmoot Meteor |
| Jindivick Heroine 8th .. | 57868 | 273 | N.C.K. | 11,976 | 4·44 | 532·3 | 350 | Mature | 440, 450, 414, 532, 595, 589, 486 | Somerville Master Babs |
| Jindivick Rosette 2nd .. | Vol. 31 | 273 | N.C.K. | 8,759 | 4·77 | 418·0 | 230 | Jr. 2 | .. .. | Jindivick Airman |
| **Ross, D. M., Croydon, Dairy Shorthorn (7).** | | | | | | | | | | |
| Trenavin Park Clarabelle .. | 2697E | 273 | 17 | 8,937 | 3·46 | 308·8 | 310 | Jr. 4 | 230, 214 .. | Willow Park Barrington 21st |
| Willow Park Camelia 39th | 1507C | 273 | 18 | 8,760 | 3·06 | 268·4 | 330 | Sr. 4 | 257, 255 .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Countess 39th | 1457B | 273 | 8 | 7,324 | 3·32 | 242·9 | 350 | Mature | 257, 227 .. | Willow Park Imperial Cran 10th |
| Willow Park Countess 40th | 1515C | 273 | 16 | 10,500 | 3·54 | 371·6 | 350 | Mature | 289 .. | Willow Park Imperial Cran 10th |
| Willow Park Duchess 46th | 1527C | 273 | 11 | 7,456 | 3·84 | 286·2 | 350 | Mature | 275, 236 .. | Anderson Imperial Cran 6th (Imp.) |
| Willow Park Duchess 53rd | 2724E | 273 | 17 | 7,624 | 3·60 | 274·5 | 310 | Jr. 4 | 228, 258 .. | Willow Park Imperial Cran 34th |
| Willow Park Moss Rose 22nd | 1696D | 273 | 25 | 9,108 | 3·47 | 315·9 | 350 | Mature | 215 .. | Wicklesham Lord Barrington 5th (Imp.) |
| **St. Joseph's Home, Sebastopol, Jersey (8).** | | | | | | | | | | |
| Belgonia Lady Capture .. | 70236 | 273 | 7½ | 5,016 | 4·97 | 249·1 | 350 | Mature | 272, 299, 386, 289 | Design's Ruler (Imp.) |
| St. Joseph's Ann 3rd .. | Vol. 32 | 273 | 14 | 5,074 | 6·48 | 328·6 | 230 | Jr. 2 | .. .. | Marfield Joker |
| St. Joseph's Buttercup 2nd | C.R. | 150 | 4 | 2,355 | 6·67 | 157·0 | 310 | Jr. 4 | 258, 293 .. | Marfield Joker |
| St. Joseph's Capture 3rd | Vol. 32 | 273 | 10½ | 4,655 | 6·03 | 280·6 | 230 | Jr. 2 | .. .. | Marfield Joker |
| St. Joseph's Gloria .. | C.R. | 273 | 13½ | 4,674 | 6·05 | 282·8 | 230 | Jr. 2 | .. .. | St. Joseph's High Design |
| St. Joseph's Marie .. | Vol. 31 | 273 | 15 | 6,855 | 5·65 | 387·1 | 310 | Jr. 4 | 349 .. | Selsey Weigelia's Prince |
| St. Joseph's Patricia 3rd | Vol. 32 | 273 | 8 | 4,091 | 5·50 | 225·0 | 230 | Jr. 2 | .. .. | St. Joseph's High Design |
| St. Joseph's Queen of Diamonds | C.R. | 90 | 4 | 1,350 | 5·07 | 68·5 | 230 | Jr. 2 | .. .. | St. Joseph's High Design |
| **Shearman, A. and W., Darnum, Jersey (6).** | | | | | | | | | | |
| Darnum Park Eminence's Finesse | Vol. 31 | 273 | N.C.K. | 5,927 | 5·26 | 311·9 | 350 | Mature | 350, 304 .. | Glen Iris Finesse Oxford |
| Darnum Park Lady Starbright 2nd | Vol. 33 | 273 | N.C.K. | 5,291 | 6·03 | 321·6 | 230 | Jr. 2 | .. .. | Melrose Island Prince |
| Darnum Park Molly's Attraction | Vol. 32 | 273 | N.C.K. | 6,900 | 5·55 | 382·9 | 350 | Mature | 356, 378 .. | Darnum Park Lord Starbright 2nd |
| Darnum Park Princess 5th | Vol. 31 | 273 | N.C.K. | 6,297 | 5·70 | 358·7 | 270 | Jr. 3 | 278 .. | Darnum Park Lord Starbright 2nd |
| Darnum Park Princess Joy 3rd | C.R. | 273 | N.C.K. | 5,453 | 5·65 | 307·9 | 230 | Jr. 2 | .. .. | Melrose Island Prince |
| Darnum Park Starbright 5th | Vol. 32 | 273 | N.C.K. | 4,955 | 6·48 | 320·9 | 230 | Jr. 2 | .. .. | Melrose Island Prince |
| **Simmons Bros., Lilydale, Jersey (5).** | | | | | | | | | | |
| Devon Park Aim's Gem 2nd | Vol. 33 | 273 | N.C.K. | 4,345 | 6·86 | 298·2 | 230 | Jr. 2 | .. .. | Karrara Eileen's Aim |
| King's Vale Rose 5th .. | 44701 | 273 | N.C.K. | 6,219 | 4·60 | 285·9 | 350 | Mature | .. .. | Melrose Waywode |
| King's Vale Rosella 23rd .. | 53571 | 273 | N.C.K. | 6,672 | 5·78 | 385·5 | 350 | Mature | 307, 221 | Melrose Waywode |
| Willis Vale Pilot's Clover .. | Vol. 31 | 273 | N.C.K. | 5,427 | 5·71 | 310·0 | 270 | Jr. 3 | .. .. | Willis Vale Prince's Pilot |
| Willis Vale Wyn's Beauty | Vol. 31 | 273 | N.C.K. | 6,122 | 5·38 | 329·1 | 250 | Sr. 2 | .. .. | Willis Vale Prince's Pilot |
| **Smith Bros., Mirboo North, Jersey (3).** | | | | | | | | | | |
| Sylvan Hill Alma Belle 2nd | 84053 | 273 | N.C.K. | 6,703 | 5·27 | 353·2 | 350 | Mature | 256, 316, 328 | Glen Iris Bow Bells |
| Sylvan Hill Bluebell .. | 50735 | 273 | N.C.K. | 5,190 | 4·65 | 241·5 | 350 | Mature | 345, 321, 405, 396, 347, 347, 417, 337, 205 | Somerville Heir Apparent |
| Sylvan Hill Linda .. | 64410 | 273 | N.C.K. | 8,081 | 5·01 | 404·6 | 350 | Mature | 327, 414, 363, 418, 429, 398, 371 | Glen Iris Bow Bells |
| **Smith, R. W., and Son, Koo-wee-rup, Friesian (5).** | | | | | | | | | | |
| Homeleigh 252 .. .. | Vol. 15 | 273 | 9 | 5,831 | 4·02 | 234·6 | 250 | Sr. 2 | 298 .. | Kelvale Democrat |
| Homeleigh 267 .. .. | C.R. | 273 | 11 | 5,611 | 3·14 | 176·2 | 230 | Jr. 2 | .. .. | Kelvale Democrat |
| Warwick Mona Patch .. | C.R. | 240 | 4 | 5,175 | 3·48 | 180·3 | 250 | Sr. 2 | 256 .. | Elma Iona Patch |
| Warwick Spring Patch .. | Vol. 15 | 273 | 16 | 7,288 | 3·47 | 253·1 | 250 | Sr. 2 | 331 .. | Elma Iona Patch |
| Wattle Bank Susan .. | C.R. | 240 | 4 | 5,602 | 2·97 | 166·4 | 270 | Jr. 3 | 337 .. | Wattle Bank Oakview Segis |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk Last Day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard Required. | Class. | Previous Yields of Butter Fat. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Stephens, Dr. F. G., Vermont, Guernsey (4).** | | | | | | | | | | |
| Roads End Dannielle .. | 11376 | 273 | 28 | 8,619 | 4·52 | 389·3 | 310 | Jr. 4 | 326 .. | Vermont Melfort |
| Vermont Henrietta | 9561 | 273 | 17 | 9,411 | 4·64 | 436·6 | 350 | Mature | 164, 274, 330, 453, 443 | Roads End Henri |
| Vermont Mab .. .. | Vol. 15 | 273 | 16 | 6,114 | 5·26 | 321·7 | 230 | Jr. 2 | .. .. | Vermont Camilla's Sunrise |
| Vermont Victoria .. | 11750 | 273 | 21 | 9,090 | 4·93 | 448·0 | 330 | Sr. 4 | 319 .. | Melbourne Fleur's Victory |
| **Syme, D., Woori Yallock, Guernsey (4).** | | | | | | | | | | |
| Meadow Vale Baroness .. | Vol. 15 | 240 | N.C.K. | 4,440 | 4·94 | 219·5 | 230 | Jr. 2 | .. .. | Meadow Vale Onward |
| Meadow Vale Thrill .. | 10879 | 240 | N.C.K. | 3,285 | 4·65 | 152·7 | 250 | Sr. 2 | 193 .. | Yarraview Marvel |
| Meadow Vale Winifred .. | 10881 | 273 | N.C.K. | 4,959 | 5·59 | 277·1 | 270 | Jr. 3 | 244 .. | Vermont Prince Johnnie |
| Warrawong Warrena .. | 8038 | 240 | N.C.K. | 5,827 | 4·83 | 281·4 | 350 | Mature | 437, 449, 481 | Nundorah Climax |
| **Tandberg, G., and Son, Whitelaw, Illawarra Shorthorn (3).** | | | | | | | | | | |
| Bodalla Leap Year .. | 23978 | 180 | 4 | 5,940 | 3·23 | 191·6 | 350 | Mature | .. .. | Swanlea Lancelot |
| Douglas Vale Bonny .. | Vol. 9 | 210 | 4 | 3,705 | 3·41 | 126·3 | 230 | Jr. 2 | .. .. | Douglas Vale Tiger |
| Veresdale Bush Bee .. | 28351 | 210 | 4 | 6,705 | 3·59 | 240·4 | 350 | Mature | 264, 532, 372, 289, 266 | Ovensdale Pearl's Renown |
| **Thomas and Taylor, Hamilton, Ayrshire (1).** | | | | | | | | | | |
| Jennewar Minnie 2nd .. | 33750 | 240 | 4 | 8,362 | 4·41 | 368·6 | 350 | Mature | 296, 390, 369, 315 | Denbigh Ace |
| **Tomasetti, B. G., Drouin West, Ayrshire (10).** | | | | | | | | | | |
| Alvaston Audrey .. | 31922 | 273 | N.C.K. | 7,771 | 3·86 | 299·9 | 350 | Mature | 203, 284, 303, 338, 343, 330 | Cathcart Masterpiece |
| Glencorren Ella .. .. | 33604 | 273 | N.C.K. | 6,979 | 4·70 | 328·1 | 350 | Mature | 282, 314, 361, 366 | Scotswood Flashlight |
| Glencorren Gay Girl .. | 35439 | 273 | N.C.K. | 8,114 | 4·29 | 347·8 | 350 | Mature | 312, 380, 395 | Glenfalloch Pilot |
| Glencorren Lyna .. | Vol. 37 | 273 | N.C.K. | 5,373 | 4·92 | 264·4 | 230 | Jr. 2 | .. .. | Glencorren Future |
| Glencorren Marietta .. | 36321 | 273 | N.C.K. | 7,511 | 4·31 | 323·4 | 270 | Jr. 3 | 316 .. | Glencorren Future |
| Glencorren Marina .. | Vol. 37 | 273 | N.C.K. | 6,583 | 4·37 | 287·4 | 230 | Jr. 2 | .. .. | Glencorren Future |
| Glencorren Myra .. | 36324 | 273 | N.C.K. | 10,568 | 4·18 | 441·4 | 310 | Jr. 4 | 232, 379 .. | Glenfalloch Pilot |
| Roseleigh Linette .. | 35828 | 240 | 4 | 5,220 | 4·58 | 239·3 | 270 | Jr. 3 | .. .. | Roseleigh Editor |
| Roseleigh Melva .. .. | 36696 | 273 | N.C.K. | 6,168 | 4·77 | 294·0 | 250 | Sr. 2 | .. .. | Carracoorte Distributor |
| Scotswood Golden Gleam 4th | 35851 | 273 | N.C.K. | 8,062 | 4·38 | 353·0 | 250 | Sr. 2 | 289 .. | Scotswood Gallant 2nd |
| **Trevaskis, F. T., Tongala, Jersey (2).** | | | | | | | | | | |
| Ballara Dainty 3rd .. | 60443 | 273 | N.C.K. | 6,321 | 4·93 | 311·4 | 350 | Mature | 263, 274, 365, 379, 397 | Kyora Dream's Gadget 2nd |
| Ballara Marie .. .. | 85017 | 210 | N.C.K. | 3,915 | 5·62 | 219·9 | 270 | Jr. 3 | 280 .. | Glen Iris Violette's Oxford |
| **Tyssen, C. J., Warragul, Jersey (7).** | | | | | | | | | | |
| Hylsbroke Gold Dust .. | 57734 | 210 | N.C.K. | 6,120 | 4·57 | 279·9 | 350 | Mature | 467, 453, 405, 395 | Latrobe Starjoy |
| Hylsbroke Jolly Lassie 13th | Vol. 33 | 210 | N.C.K. | 3,660 | 5·59 | 204·0 | 230 | Jr. 2 | .. .. | Ballara Grandmaster |
| Hylsbroke Jolly Lassie 16th | Vol. 33 | 210 | N.C.K. | 2,812 | 5·50 | 154·7 | 230 | Jr. 2 | .. .. | Ballara Grandmaster |
| Hylsbroke Marina 2nd .. | 81844 | 273 | N.C.K. | 7,268 | 5·39 | 391·8 | 350 | Mature | 448, 420 .. | The Wattle's Young Gamboge |
| Hylsbroke Rosemary .. | 76884 | 210 | N.C.K. | 5,684 | 4·89 | 278·0 | 350 | Mature | 285, 326, 333, 359 | The Wattle's Young Gamboge |
| Hylsbroke Sunbeam 3rd .. | Vol. 32 | 240 | N.C.K. | 3,420 | 5·04 | 172·5 | 230 | Jr. 2 | .. .. | Ballara Grandmaster |
| Murchison Princess Carrie | 63271 | 273 | N.C.K. | 6,989 | 5·02 | 351·0 | 350 | Mature | .. .. | Murchison Prince Albert |
| **Unthank, Miss Freda, Hastings, Jersey (5).** | | | | | | | | | | |
| St. John's Coral 2nd .. | 78821 | 273 | N.C.K. | 4,194 | 5·52 | 231·3 | 350 | Mature | 384, 296 .. | St. John's Curio 9th's Lad |
| The Hollies Fancy 6th .. | Vol. 33 | 273 | N.C.K. | 3,956 | 6·25 | 247·3 | 230 | Jr. 2 | .. .. | The Hollie's Reputation |
| The Hollie's Primrose .. | Vol. 33 | 273 | N.C.K. | 4,227 | 6·35 | 268·6 | 230 | Jr. 2 | .. .. | Windrest Ranee Lad |
| The Hollie's Seaweed 3rd.. | 84153 | 273 | N.C.K. | 6,077 | 5·11 | 310·3 | 330 | Sr. 4 | 259, 272, 237 | The Hollie's Chief |
| The Hollie's Queen 7th .. | Vol. 33 | 273 | N.C.K. | 4,813 | 6·62 | 318·6 | 250 | Sr. 2 | 295 .. | Windrest Ranee Lad |
| **Vaughan Bros., Girgarre, Jersey (8).** | | | | | | | | | | |
| Lynroy Beta 5th .. | 87571 | 273 | N.C.K. | 11,405 | 6·02 | 687·1 | 310 | Jr. 4 | 409 .. | Lynroy Pixie's Prince |
| Lynroy Coral .. .. | Vol. 31 | 273 | N.C.K. | 7,479 | 5·49 | 410·3 | 350 | Mature | 262, 450, 339 | Werribee Laverock |
| Lynroy Fantasia .. | Vol. 31 | 273 | N.C.K. | 5,233 | 5·63 | 294·7 | 230 | Jr. 2 | .. .. | Lynroy Pixie's Prince |
| Lynroy Glade 2nd .. | 87574 | 273 | N.C.K. | 7,149 | 5·61 | 401·2 | 270 | Jr. 3 | .. .. | Carellen Madeira's Pride |
| Lynroy Heatherbelle .. | Vol. 31 | 273 | N.C.K. | 9,097 | 4·87 | 442·6 | 330 | Sr. 4 | 380, 422 .. | Werribee Laverock |
| Lynroy Nancy Belle 3rd.. | 87576 | 273 | N.C.K. | 6,475 | 5·39 | 348·7 | 290 | Sr. 3 | 274, 297 .. | Lynroy Pixie's Prince |
| Lynroy Nectar .. .. | C.R. | 273 | N.C.K. | 7,176 | 6·00 | 430·9 | 350 | Mature | 349, 388 .. | Carellen Madeira's Pride |
| Lynroy Vanity Fair .. | 82559 | 273 | N.C.K. | 7,327 | 5·31 | 389·0 | 350 | Mature | 376, 371, 469 | Werribee Laverock |

| Name of Cow. | Herd Book No. | No. of Days in Test. | Milk last day of Test. lb. | Milk. lb. | Average Test. | Butter Fat. lb. | Standard required. | Class. | Previous Yields of Butter Fat. | Sire |
|---|---|---|---|---|---|---|---|---|---|---|
| **Wade, G. F., Stratford, Jersey (7).** | | | | | | | | | | |
| Inverbroom Air Fydd 2nd | Vol. 31 | 273 | N.C.K. | 4,818 | 5·81 | 279·8 | 230 | Jr. 2 | .. .. | Banyule Airport |
| Inverbroom Air Marie .. | 81874 | 273 | 26 | 10,788 | 6·43 | 693·9 | 310 | Jr. 4 | 333, 525 .. | Banyule Airport |
| Inverbroom Double Ruby.. | Vol. 31 | 273 | N.C.K. | 4,691 | 5·14 | 241·1 | 230 | Jr. 2 | .. .. | Inverbroom Double Purple |
| Inverbroom Marie's Rochette | Vol. 31 | 273 | N.C.K. | 4,781 | 5·70 | 272·5 | 230 | Jr. 2 | .. .. | Inverbroom Marie's Airport. |
| Inverbroom Purple Ruby.. | Vol. 31 | 273 | N.C.K. | 5,049 | 5·26 | 265·6 | 230 | Jr. 2 | .. .. | Inverbroom Double Purple |
| Inverbroom Ruby's Eminent | 81877 | 273 | 16 | 7,915 | 5·29 | 418·8 | 310 | Jr. 4 | 302, 351 .. | Clarendon Eyre Eminent's Boomerang 4th |
| Inverbroom Silver Eminent | Vol. 31 | 273 | N.C.K. | 5,757 | 6·10 | 350·9 | 230 | Jr. 2 | .. .. | Inverbroom Marie's Airport. |
| **Walker, C. S., Swan Hill, Jersey (1).** | | | | | | | | | | |
| Grangelea Rosette .. | 81598 | 273 | N.C.K. | 7,646 | 5·74 | 438·9 | 290 | Sr. 3 | 273, 308 .. | Navua Wonderful Count |
| **Waterhouse, H. W., and Son, Pakenham, Jersey (2).** | | | | | | | | | | |
| Navuloa Royal Lady .. | 88160 | 273 | 18 | 7,622 | 5·97 | 455·4 | 270 | Jr. 3 | 344 .. | Ovalau Magnet's King |
| Ovalau Milky Way .. | Vol. 31 | 273 | 17½ | 6,672 | 5·11 | 341·1 | 230 | Jr. 2 | .. .. | Werribee Planet |
| **Whelpton, B., Whittlesea, Jersey (1).** | | | | | | | | | | |
| Hemswell Entaxia .. | C.R. | 240 (Herd withdrawn) | .. | 5,220 | 4·57 | 238·6 | 230 | Jr. 2 | .. .. | Windrest Dreaming Pioneer |
| **Williams, L., Bamawm Extension, Jersey (7).** | | | | | | | | | | |
| Bamawm Fancy Gem .. | 47100 | 273 | N.C.K. | 8,520 | 5·81 | 494·8 | 350 | Mature | 357, 412, 490, 429, 479, 591, 616, 536, 464 | Bamawm Leon |
| Bamawm Fancy Madeira 2nd | 85062 | 273 | N.C.K. | 6,488 | 5·97 | 387·2 | 310 | Jr. 4 | 369, 295 .. | Mornmoot War Hero |
| Bamawm Lady Bell .. | Vol. 31 | 273 | N.C.K. | 5,643 | 6·10 | 344·0 | 230 | Jr. 2 | .. .. | Bamawm Lady's Masterpiece |
| Bamawm Lady Gem .. | Vol. 31 | 273 | N.C.K. | 5,418 | 5·70 | 308·7 | 230 | Jr. 2 | .. .. | Bamawm Lady's Masterpiece |
| Bamawm Princess Noella 2nd | 85070 | 273 | N.C.K. | 10,143 | 6·18 | 627·1 | 310 | Jr. 4 | 409, 506 .. | Mornmoot War Hero |
| Headland Sybil's Gloria .. | 71756 | 273 | N.C.K. | 11,148 | 4·60 | 513·3 | 350 | Mature | .. .. | Mittabah Bowlina's Sultan. |
| Warwick Tranquil Star .. | C.R. | 273 | N.C.K. | 5,126 | 5·00 | 256·2 | 230 | Jr. 2 | .. .. | Navua Wonderful Star |
| **Williams, Estate of the late F. A., Bamawm Extension, Jersey (1).** | | | | | | | | | | |
| Bamawm Daisy Bell 2nd.. | 80119 | 273 | N.C.K. | 10,176 | 5·96 | 606·3 | 350 | Mature | 437, 514, 516 | Bamawm Mystic Lad |
| **Wilson, A., Port Fairy North, Ayrshire (7).** | | | | | | | | | | |
| Jennawar Lorretta .. | 32627 | 240 | 4 | 4,650 | 4·18 | 194·2 | 350 | Mature | 174, 239, 281, 247 | Denbigh Ace |
| Lough View Beauty .. | 32775 | 240 | 4 | 6,870 | 4·17 | 286·4 | 350 | Mature | 308, 398, 283 | Carracoorte Bobby |
| Lough View Beauty 5th .. | 36577 | 240 | 4 | 4,470 | 4·80 | 214·4 | 270 | Jr. 3 | 190 .. | Lough View Bell Lad |
| Lough View Belladonna 2nd | 34858 | 273 | 6 | 6,530 | 3·92 | 255·9 | 350 | Mature | 199, 242, 267 | Carracoorte Bobby |
| Lough View Music 7th .. | 36584 | 273 | 11 | 5,533 | 4·32 | 239·1 | 250 | Sr. 2 | 209 .. | Lough View Victor |
| Lough View Rosebloom 2nd | 35686 | 273 | 7 | 4,235 | 4·54 | 192·3 | 310 | Jr. 4 | 171, 205 .. | Lough View Bell Lad |
| Rivery Park Radio .. | 35796 | 210 | 4 | 4,365 | 4·78 | 208·7 | 350 | Mature | 316, 264 .. | Rivery Park Midnight |
| **Wilson, A., Tongala, Jersey (2).** | | | | | | | | | | |
| Strathbow Goldie 24th* .. | 73976 | 273 | N.C.K. | 6,176 | 6·79 | 419·3 | 350 | Mature | 377, 420 .. | Tooravale Arbitrator |
| The Valley Merry April .. | 64543 | 273 | N.C.K. | 7,091 | 4·89 | 346·4 | 350 | Mature | .. .. | Glen Iris Beau |
| **Woodyer, P. A., Mornington, Jersey (1).** | | | | | | | | | | |
| Rochdale Lillian 3rd .. | 63988 | 240 | 4 | 4,740 | 5·45 | 258·4 | 350 | Mature | .. .. | Rochdale Golden |

*Calved 81 days before first test taken.